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Telephone Engineer

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Government Assistance to Utilities

There has been widespread complaint to the effect that the Reconstruction Finance corporation has confined its beneficial assistance to railroads and large banks Other lines of business are claiming a share in the activities of this government organization.

Accustomed to rely on their own mental and financial resources few telephone companies have taken up this popular cry for government assistance. However if and when the Reconstruction Finance corporation decides to distribute its finances more widely, it seems to us that no business is more worthy of assistance than the telephone business.

Actual constructive results could be achieved from lending telephone companies funds with which to complete construction programs, many of which were started two or three years ago, but cannot be continued because of an unexpected lack of finances. Communication would not only be greatly improved for millions of telephone subscribers, but employment would be furnished for thousands now unable to find work.

If money were available at this time, telephone

companies could purchase equipment and supplies, sufficient to last many years, at a cost figure far below what the material normally would be worth. This would help keep the manufacturers of equipment and their many employees busy supplying this material to telephone companies. Labor, too, could be secured more cheaply than ordinarily, and undoubtedly more cheaply than it will be available a few years hence.

The construction work started by telephone companies will of necessity be finished within the next few years. It will be impossible to delay indefinitely, if telephone systems are to be maintained properly. Service to present patrons and extensions to accommodate prospective subscribers demand continued maintenance.

If this work is to be done eventually, it might as well be done now, at a great saving. And it can be done if the government will step in and lend its assistance to a program which will go far toward alleviating the greatest current problem of all—unemployment. In addition the government would be assisting the telephone companies to construct new lines, put cable underground, and otherwise maintain their properties—at a saving which would undoubtedly be reflected in rate adjustments.

Here is an opportunity for the government to do a real job. Will it do it?

Keep the Organization Intact

Telephone companies of course are deeply interested in the problem of providing a living for their regular employees, during times when it is not possible to give each person permanent employment.

The Bell Telephone company is meeting this situation by part time employment for each regular employee. This organization some time ago adopted a five-day week. A shorter working week has recently been inaugurated in certain branches of the company when the five-day week became unfeasable. In this way all former Bell employees are provided with some income for themselves and their families, and no partiality is shown.

This plan of some work for all, we believe, should be applied to all telephone companies regardless of size or location. Inasmuch as several economists have advanced the theory that the ultimate outcome of the present unemployment problem will be shorter working hours for all at living wages, it might not be a bad idea to start working on this theory, even though the present part-time wages undoubtedly are lower than an adequate living wage. At any rate the part time plan is a humane one, for even small wages will prevent hunger and want, and usually all serve to supplement savings or the wages of other members of the family, until such time as the business world regains normalcy, and normal pay for all can be resumed.

Also, when telephone companies keep their regular force on a part-time basis, the companies are thus in a position to resume extensive activities on short notice, and in case of emergencies, help can be marshalled and difficulties overcome within a few hours.

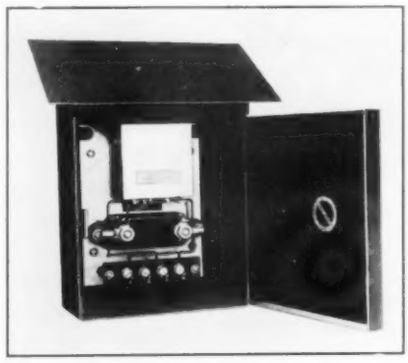
Other lines of industry too, would do well to pattern after this plan, and thus help keep the number of unemployed persons to the minimum. In fact, if all businesses would adopt this plan, very few families would be entirely dependent upon charity.

One Antenna Accommodates 3,000 Radios

Western Electric Company announces equipment which will meet requirements of modern hotels, apartments and other multiple dwellings where unsightly wiring often mars beauty of property. The following description is interesting

A system whereby as many as 3,000 radio receiving sets can operate independently on the same antenna without interfering with each other has been perfected, according to an announcement by the Western Electric company. By adding further apparatus, the number of sets can be increased indefinitely without impairing the quality of reception. The sets can be of any make the individual chooses. A city's roofs freed of the fire hazard and the unsightly tangle of innumerable individual antennas thus becomes a scientific possibility.

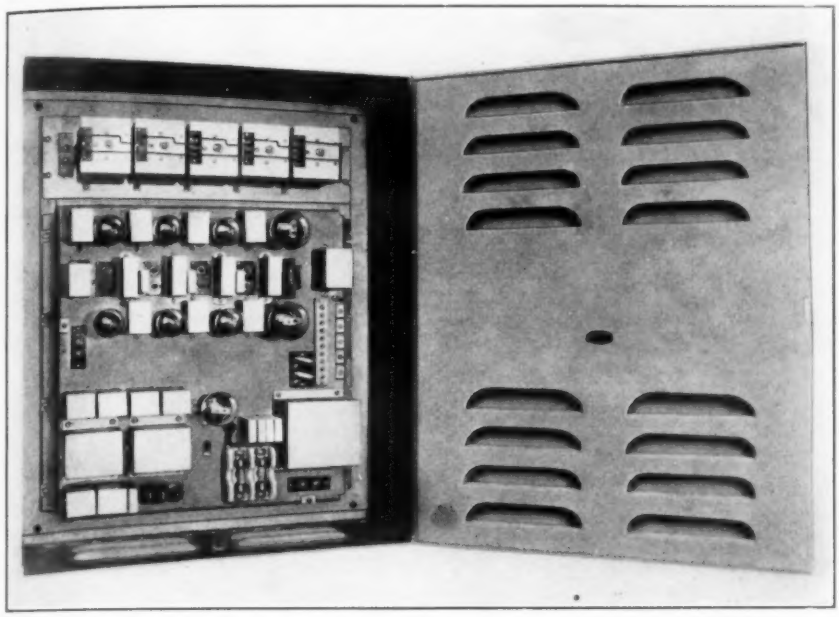
The system is designed primarily for hotels, apartments and other multiple dwellings and is aimed to overcome the increasing problems which dwellers in such buildings face in obtaining good antenna facilities for their radios at reasonable cost. Modified forms of the system have also been designed to operate a much smaller number of radio sets. The same technical improvements devoted to the large community receiving system are embodied in these smaller forms and are made available on a scale that is suitable even for the individual home owner and his one radio set.



No. 245. A Panel mounted in Graybar Cabinet

The system was designed by engineers of Bell Telephone Laboratories and employs the principles used in long distance telephone circuits. These principles have for some time shown their

effectiveness in the broadcasting end of radio and have become standard there.



No. 78 A Amplifier mounted with No. 244 A Panel in a Graybar cabinet.

In this type of construction, the broadcasting transmitter is connected to its antenna by a transmission line several hundred feet long. In the new type of receiving system, the same principles of construction which meet the rigid requirements of the broadcasting station for transmission and for protection from outside interference are, generally speaking, used in reverse order.

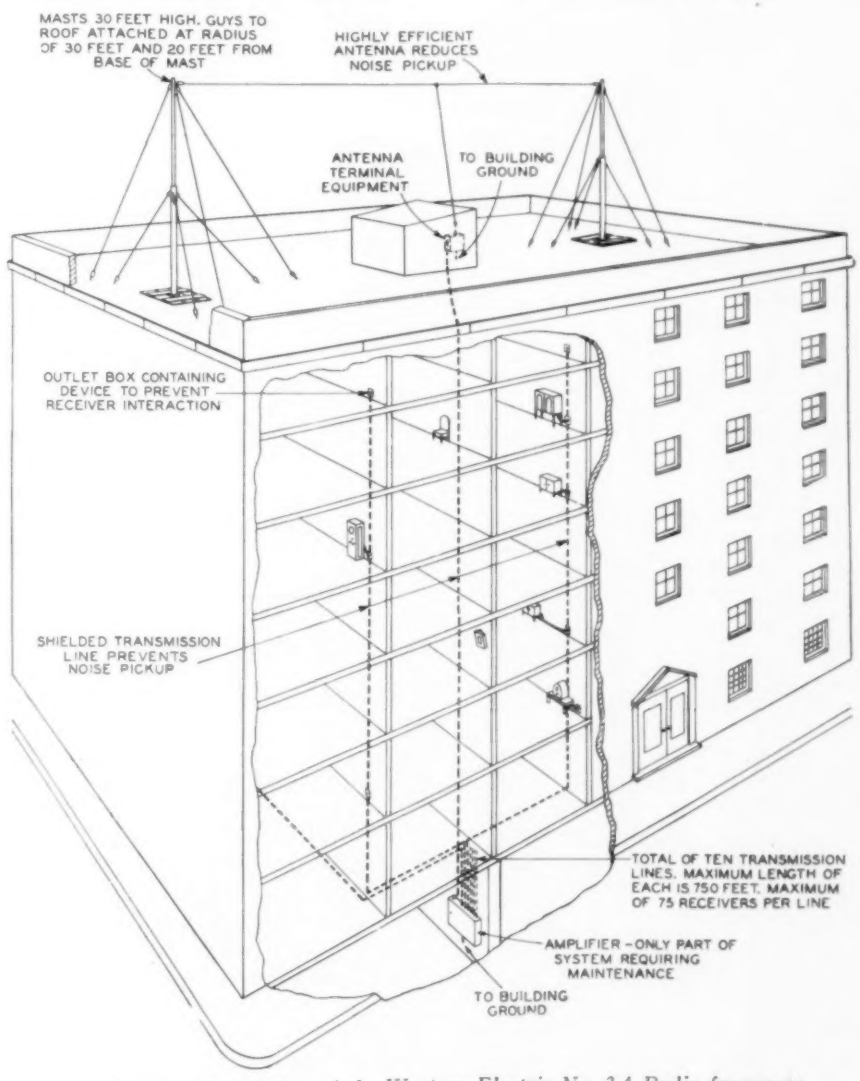
The receiving system is protected against "man-made" static, those interferences which the ordinary lead-in wire commonly picks up from sources within a building, such as elevator motors and other electrical devices. The loss in receiving power usually caused by the great length of the lead-in wire and its high capacity to ground is overcome. Every receiving set connected to the system is electrically isolated so that it cannot put any noises back into the system to disturb the operation of others on the line.

The first requirement of the system is a properly constructed antenna. With only one antenna involved, the space limitations imposed by crowding many individual antennas on a roof are eliminated and the best principles of construction can be observed. The unit cost of the antenna per receiving set is lowered because of the large number of sets sharing the same facilities.

The antenna is connected to the transmission line through a panel which consists essentially of a suitable lightning arrester, a terminal strip and a repeating coil designed to transfer most efficiently the energy collected by the antenna to the transmission line. The transmission line running from this panel to the amplifiers is one of the vital features of the system. It is a "coaxial conductor," or a conductor within a conductor. This cable, which plays the part of the lead-in wire in the ordinary antenna system, consists of a single strand of No. 18 wire insulated with a special low-capacity rubber compound. Over this, copper braid is woven tightly and then covered with an impregnated cotton braid or, where exposed to the elements, lead sheath. The copper braid itself serves as a conductor. It is grounded and, by picking up outside radio interferences before they reach the inner strand and dissipating them, shields the transmission line itself. This cable can furnish a connection as long as 750 feet from the antenna panel to the amplifiers.

The transmission line terminates in a selective volume control panel. This includes five adjustable filters designed for use with a low impedance radio frequency line. The filters reduce the signal strength from nearby radio stations to prevent overloading the radio receivers and amplifiers, without reducing the signal strength from other stations. The panel is associated with a power amplifier of the four-stage, neutralized, un-

(*Continued on page* 38)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ANTENNA TERMINAL EQUIPMENT
TO BUILDING GROUND
OUTLET BOX CONTAINING DEVICE TO PREVENT RECEIVER INTERACTION
SHIELDED TRANSMISSION LINE PREVENTS NOISE PICKUP
TOTAL OF TEN TRANSMISSION LINES. MAXIMUM LENGTH OF EACH IS 750 FEET. MAXIMUM OF 75 RECEIVERS PER LINE
AMPLIFIER - ONLY PART OF SYSTEM REQUIRING MAINTENANCE
TO BUILDING GROUND

A typical installation of the Western Electric No. 3A Radio frequency Distribution system.

VACUUM TUBE THEORY AND PRACTICE

SUBJECT: SOUND PROJECTION PRACTICE PART IV

This is the second and last installment of the article on Sound Projection Practice, Part VI. The first section of this article appeared in the June issue.

Push Push Power Amplifiers

A new type of power amplifier circuit which first made its debut during 1931 and which is rapidly becoming popular is known as the "push push" or Class B amplifier.

The circuit of the push push type of amplifier is practically identical to that

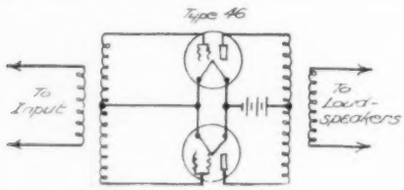


Fig. 9. Push Pull Amplifier using type 46 tubes.

of the push pull, and the chief difference is in the method of biasing and operating the power tubes. In the push pull type of amplifier the grids of the power tubes are biased so that the tubes operate over the straight portion of the curve and the grid voltage swing is restricted to a value such that the grids do not swing positive. In the push push type of amplifier the grids are almost to the point at which the plate current is zero. A high input voltage is applied which is sufficient to swing the grids positive over a portion of the cycle. Due to the fact that the grid voltage-plate current characteristic curve is fairly straight even in the positive region, it is thus possible to get a much greater plate current change than was possible when the input voltage must be limited to a value such that the grid at no time swings positive.

The distortion due to the non-linear character of the lower portion of the grid voltage-plate current characteristic curve cancels out as a result of the differential action of the plate circuits of the two cubes hence quality practically comparable with that obtained from a push pull type of amplifier results.

While it was stated above that the circuit of the push push type of amplifier was practically identical with that of the push pull amplifier this statement should be qualified by the fact that the operating characteristics of the push push arrangement make necessary a special type of input transformer and a low impedance grid bias source. Due to the fact that the grid of the power amplifier tubes swings positive during a portion of the input cycle, it is obvious that grid current will flow, hence a low resistance secondary winding on the input transformer must be employed otherwise the drop in voltage that would occur would cause severe distortion. For this reason the type of transformer ordinarily employed in push pull amplifiers cannot be used.

It has been found that B batteries make the best source of grid bias for push push stages. In order to dispense with the necessity for a separate source of grid bias voltage, the tube manufacturers recently introduced a new tube known as the type 46. This tube when used in a push push amplifier requires zero grid bias, hence dispenses entirely with the need for any source of bias voltage. Two of the new tubes will deliver in a push push connection 20 watts of audio power.

Another feature of the push push amplifier which requires different treatment than does the push pull type, is the fact that actual power must be supplied by the amplifier tubes immediately preceeding the power amplifier stage.

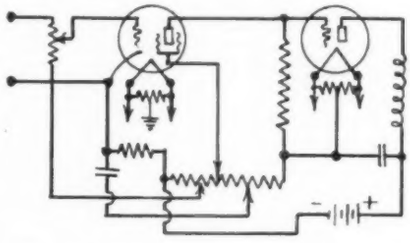


Fig. 10. Schematic of direct coupled amplifier.

This means that a tube capable of supplying a small amount of actual power is required rather than a tube of the voltage amplifier type which we previously discussed.

A single 46 type tube is capable of delivering 10 watts of audio power with a plate voltage of 400. When it is considered that the rating of the UV-211 tube which is commonly known as a 50 watt tube (when used in radio frequency circuits) is only 10 watts in a push pull amplifier, the possibilities of push push amplification can be seen.

Using two 203-a tubes in a push push circuit it is possible to get as much as 200 watts of audio power. This same amount of power obtained from 250 type tubes in the conventional push pull circuit would require 20 separate amplifiers connected in parallel.

The push push amplifier is too new to form a definite opinion as to its apparent quality as compared to the push pull arrangement, and such data as has been collected indicates that it will be "almost as good" as the push pull amplifier. One editor of a technical journal recently pointed out that there seemed to be a tendency for a push push type amplifier

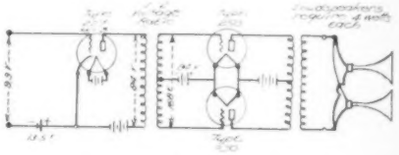


Fig. 11. Amplifier design.

to turn out good quality on fairly high input signals but to distort somewhat on low inputs indicating that the operation when restricted to the lower portion of the curve was not as faithful as might be desired. Fig. 9 illustrates the use of two of the new type 46 tubes in a push pull circuit.

Direct Coupled Power Amplifiers

The direct coupled amplifier is an arrangement whereby the plate of a voltage amplifying tube may be connected directly (without a series condenser) to the grid of the succeeding tube, thus eliminating frequency distortion which sometimes results where improper transformer, resistance, or impedance coupling is used between the power stage and the preceeding voltage stage.

The direct connection of the voltage stage to the grid of the power stage is made possible by keeping the filament of the power stage at a higher potential (with respect to ground or the common point in the circuit) than the filament or cathode of the preceeding voltage stage. The grid current of the power stage is returned to the filament through a high resistance R_1 (see Fig. 10) and bias for the power stage provided by the drop across this resistor. But due to the unique connections employed, the plate of the voltage is kept at a positive potential while the grid of the power stage is kept at a negative potential. A con-

sideration of the return paths of the grid and plate currents of the power stage as shown in figure 10 will make clear the method employed.

The direct coupled amplifier attracted considerable attention when it was first introduced several years ago, and it was given much space in the technical journals as being the ideal amplifier inasmuch as it was supposed to be perfectly flat in frequency characteristics over a wide range. For various reasons it has not been employed to a very large extent in commercial sound projection amplifiers.

Design of Power Amplifiers

The design of power amplifiers, where it is desired to build, rather than purchase an amplifier, involves the selection of a suitable circuit and of tubes having proper output to fit the specific application for which the amplifier is designed.

As previously stated, the term "power amplifier" implies the power output stage together with whatever voltage amplification is incorporated in the same housing as the power amplifier. If sufficient voltage output is available in the microphone amplifier, it may be possible to operate the power amplifier stage directly from this amplifier without the necessity for voltage amplification in the same cabinet. This can be readily determined by computing the voltage swing available at the output of the microphone amplifier (peak values) and comparing this to the normal grid bias specified for the power stage. To produce maximum undistorted output the voltage swing available at the microphone amplifier output plus any additional gain derived from the coupling transformer should be equal to the specified grid bias for the power stage.

In order to show the method used in working out the design of a power amplifier, let us consider a power amplifier having one stage of voltage amplification feeding into a push pull output stage. Let us assume that we have decided to use transformer coupling between the voltage and power stage and in the normal push pull connection as shown in Figure 11. The load we desire to supply with audio power is two high capacity projectors requiring 4 watts each. The following steps will give us the answer as to the type tubes to employ and the input voltage required to give maximum undistorted output from the amplifier.

1.—Determine the total amount of power to be supplied to the load. In the example taken the total power to be supplied is 8 watts. An examination of the power output of the various power tubes as listed in Table 1 (June issue) indicates that the type 250 tube if used in push pull would deliver 9.3 watts hence would be the most economical tube to use.

2.—Next determine which of the commonly used voltage amplifying tubes shown in Table 2 would have sufficient capacity to swing the power stage. Let us pick the type 227 tube and see if it will work properly in our amplifier. From the table describing the characteristics of this tube we learn that it has a voltage amplification factor of 9 and requires 13.5 volts grid bias with a plate potential of 180 volts. If we turn to Table 1 we find that the 250 tube requires 84.0 volts grid bias, hence it is apparent that we must supply a total swing of 168 volts across the secondary of the coupling transformer in order to produce maximum output of each power tube.

Working backward from the secondary of the coupling transformer we would require 84 volts across the primary of this transformer inasmuch as the one used has a ratio of 1:2. To produce 84 volts in the plate circuit of the voltage stage would require approximately 9.3 volts (peak value) applied to the grid of the voltage stage. The actual amount of voltage amplification that can be obtained from any tube depends on the characteristics of the primany of the coupling transformer. With present high grade transformers practically all of the gain of the tube can be realized.

Inasmuch as we find that 9.3 volts peak potential applied to the grid of the voltage amplifying stage will produce maximum output of the power stage and we compare this with the rated grid bias voltage required on the 227 which was 13.5 volts, it is apparent that the 227 tube will work nicely in our amplifier without danger of overloading.

It should be particularly noted that the preceeding computations are based on the fact that the three element tube will give fairly linear amplification as long as the grid is not allowed to swing positive. The permissible grid swing of any three element tube can therefore be determined by noting the recommended negative grid bias. It should be remembered that we have considered only peak values in the preceeding computations and if we wish to consider the input voltage we would get by instrument measurement we must divide our peak values by 1.41. to convert them to effective values. For example in the example worked out we would require a peak voltage of 9.3 volts to produce maximum output and an effective voltage of only 9.3/1.4=.66 volts.

In order to illustrate how the wrong tube might be selected let us assume that we had selected the type 230 tube instead of the 227. The 230 tube requires a grid bias of 4.5 volts and has an amplification factor of 8.8. Again working backwards from the secondary winding of the output transformer, we would require 84 volts in the primary winding and dividing this by the amplification factor of the tube we would require approximately 9.5 volts across the grid circuit of the voltage stage to produce maximum output in the output stage. Inasmuch as the 230 tube has a grid bias of only 4.5 volts it is apparent that this tube could not be used without severe distortion because of the grid swinging positive.

3.—After tubes have been selected for the voltage and power stages it is necessary to consider what method of coupling will be used in the input and output stages of the amplifier.

It should be kept in mind that maximum undistorted output is obtained from a vacuum tube when the impedance into which the plate circuit feeds is twice that of the rated plate impedance of the tube. Transformers suitable for connecting the output circuit of microphone amplifier to the grid circuit of the power amplifier should have impedance ratios of approximately 10,000 to 100,000 (turns ratios of 1 to 3 or 1 to 4). The input transformer should be placed in the power amplifier cabinet and not in the microphone amplifier, as this reduces the tendency for the high impedance input circuit picking up exteraneous noises.

The output circuit of a power amplifier may be connected to the load by means of impedance-condenser coupling or by means of transformers. Transformers represent the best method as they usually permit a more accurate matching of impedances and they serve to effectively isolate the high voltage plate circuit and the lower voltage a. c. output circuit.

Figure 7 represents the several methods of matching the output circuit to the load. It should be noted that the transformer should be so selected that the load appears as having twice its actual impedance to the plate circuit. In a push pull amplifier the impedance of the two tubes are effectively in series, hence the impedance connected to the transformer primary is twice that of a single tube.

Loudspeakers may be combined in series or series-parallel combinations to produce the desired impedance relations.

DR. AND MRS. C. L. JONES TOURING ALASKA

Mr. and Mrs. C. L. Jones of Athens, Ohio, are spending the month in Alaska. Dr. Jones attended the Rotary convention in Seattle, Washington, on his way to Alaska; they expect to return the latter part of July.

Speaks on "Taxation and Legislation"

James N. Cox, President Southern Continental Telephone Company, Cookeville, Tenn., Addressed the Second Annual Southern District Meeting of the United States Independent Telephone Association on This Vitally Important Subject

Will Rogers says that all he knows is what he reads in the papers, and all I know about this subject of "Taxation and Legislation" is what I have learned in an expensive school of experience through a long period of contact with legislatures and tax boards.

During my experience many freakish and injurious bills have been introduced in the Kentucky and Tennessee legislatures, many of which were particularly directed at the telephone utilities. The legislatures had worn themselves out fighting the railroads, therefore, they started in on the weaker and younger brothers—the utilities—and undertook to make them bear the major burden of the government.

In every campaign preceding the legislatures someone or more comes to the front with some new fantastic idea of reaching, as they say, the plutocratic and monopolistic interests. Long and laborious speeches are made in the interest of some scheme to wrench the unholy dollar from these great corporations and relieve the down-trodden laboring man and farmer of their unjust tax burden. To what extent they have succeeded is best shown by the records. They have succeeded in putting on the statutes of Tennessee such special taxes as the Privilege tax, the Excise tax, the Capital Stock tax, the Inspection tax and the Income tax, and now comes the city pole tax, all of which are in addition to the common property tax paid to the state, county, city and taxing districts.

Telephone Taxes

The taxes imposed upon telephone companies are of two general kinds:

(a) Advalorem (property) taxes.

(b) All other special forms of taxes.

By far the larger portion of the taxes paid to states and subdivisions is based upon property. Assessment of the value of the property is made and rates from various taxes are fixed by the taxing authorities as applying to the property in a particular district and for a particular purpose, which briefly describes the advalorem tax.

The trend of advalorem taxes on all property has been for many years, certainly since 1920, continuously upward until the year 1931, when for the first time there was a cessation in some states, and in some subdivisions of states a tendency toward decrease in advalorem taxes. This change was affected either by the lowering of assessments in accordance with reduction of property values, or by a reduction in the advalorem tax rates. These changes were far from general and notwithstanding these adjustments to hold taxes even or to reduce them, the aggregate in the Southeast of advalorem taxes was higher in 1931 than in 1930, as far as the telephone industry is concerned.

Telephone companies pay a larger amount of taxes of an advalorem nature on their properties than does the average taxpayer—individual, manufacturer or trade corporations. This arises out of the administration of the tax laws and not out of the laws themselves. The constitutions of the several states require that the taxation of property shall be applied with uniformity and equality on all property, regardless of ownership. The tax rate must be the same on all property of the same class, but the assessments that are made on telephone company property approach 100 per cent of value, while other property (in Tennessee for example) averaged 36 per cent of its value.

Real estate constitutes a large part of taxable property but it constitutes a relatively small part of the physical property of telephone companies, the larger portion of their property being tangible personal property or franchise values, taxed at advalorem rates. This property of telephone companies and their franchises are usually assessed at the percentages that are applied to real estate.

It is a well known fact that personal property is not fully returned for taxation and when such personal property is returned, it is assessed at a much lower percentage of value than real estate is assessed. Yet all the property of the telephone companies, both real and personal franchises, is assessed on the same basis as real estate, and even at a higher percentage of value than real estate of other owners is generally assessed.

Assessing Values

There are two ways of assessing values in Kentucky for advalorem and franchise purposes. One is to take your net earnings before dividends plus interest paid and capitalize same on a 7 per cent basis, or the commission will take your outstanding securities, floating indebtedness and surplus and capitalize it on an 85 per cent basis. In Tennessee the proceedings are practically the same, but utilities taxes are assessed by the Railroad and Public Utilities commission and in Kentucky by a tax commission, not only for state, but for local purposes. Twenty-five other states also assess telephone property by state authority, and 20 states base their assessment on gross receipts, while only 11 states base same on net returns, all varying in percentages. There are 33 states that assess a franchise tax in addition to the advalorem tax and Kentucky is one of them.

The regular session of the Tennessee Legislature in 1931 did not accomplish much. About all they did was to appropriate a lot of money we did not have, and refuse to restore the so-called land tax taken off at a previous Legislature, at the Governors insistence, effective as of 1931, which cost the State, or reduced the revenues to the extent of 3½ million dollars. The first extra session was called to retrieve this loss, overcome an apparent deficit, and authorize the funding board to renew certain obligations falling due before the next regular session. Little was accomplished, so it adjourned, after appointing a joint committee to sit until the second extra session could be called in session. It was up to this committee to formulate a revenue bill to overcome the facing deficit and while it was pretty generally conceded that the land or property tax should be restored, they were afraid to undertake it. Consequently the taxes had to be found from some other source and that particular source—the most available—was the utilities. To further tax the railroads, they being on the rocks, was out of the question, so here is where the new and younger brothers came in and in they started with a rush.

Revenue Bill

This committee had about twenty days between sessions to formulate a revenue or tax bill and this is what they proposed to do to us:

(1) Double our privilege tax, which would have cost the telephone interest in the state $45,000.

(2) Pole tax 50c per pole in counties and $10.00 in cities (entirely new feature), approximated cost to telephone companies $300,000.

(3) Increase the income tax to the extent of one per cent, net results $25,000.

This revenue bill was reported out by the committee with these features included, when the second extra session met, and anyone who knows anything about the workings of legislatures in their last days, or during a 20 day session under such extraordinary conditions as confronted this particular session, trying to overcome a twelve million dollar deficit, and to refund seventeen million falling due in 1932, will realize what the telephone and other utilities were up against. We have no telephone association in Tennesse, consequently had to meet the issue with volunteers, and as usual they were few and far between, especially telephone representatives. The final results were an increase of only 50 per cent in station privilege tax. The pole tax for state and county purposes was eliminated but had to compromise with the cities on a 25 per cent per pole basis, but same is optionary with the city authorities and not mandatory, consequently it may not effect us to any great extent. Had this pole tax gone on as proposed by the Committee, it would have cost our company $15,000 per year; practically wiping out all our net revenues after having already paid State, county and city taxes to the extent of 32 per cent of our net revenue.

Federal Figures

Now for the federal figures. When Congress met in December 1930 a moderate deficit, only a few million dollars, was in prospect for June 30, 1931, and a surplus of 30 million dollars was estimated for 1932, so Congress deferred any tax revision pending another year's development. This moderate deficit for 1931 turned out to be a shortage of 903 million dollars, notwithstanding the 246 million dollars paid by foreign countries, which will not occur in 1932. When Congress met in December 1931 the estimated deficit for June 30, 1932, was $2,123,000,000, which included the 903 million dollars hangover from 1931, and according to the official forecast in the budget, the deficit for 1933 will be another $1,417,000,000.

In addition to these actual and contemplated deficits the Federal Treasury is facing 800 million dollars of Veterans compensation loans; 500 million dollars for the Reconstruction Finance Corporation, 125 million dollars for Federal Land banks and 200 million dollars as a liquidating fund for relief of depositors of defunct banks, all of which has been recommended by the President and most of same almost unanimously passed by Congress. This amounts to the colossal deficit of $4,625,000,000, not counting the proposed soldier's bonus of two billion dollars, which is $40 per head of population or $200 for each and every family in the entire country. Now add to this the usual and actual federal expenditures and the state and local taxes and we have a yearly tax debt of $107 for every man, woman and child in Tennessee. How is this huge deficit to be met? Increased taxes, of course—as far as it is possible—and by Government borrowings for the balance.

U. S. Treasury Program

The Treasury or administration program proposed early in the present session of Congress provided for an increase in normal income to 2, 4 and 6 per cent, instead of 1½, 3 and 5 per cent, and a surtax of from 1 per cent beginning at $10,000 and increasing to 37 per cent up to $200,000, and reaching a maximum of 40 per cent on incomes of more than $500,000, but the Senate Committee has now recommended a normal tax to 3, 6 and 9 per cent and the highest bracket of surtax to 45 per cent. None of these surtaxes, however, will touch any of us personally, as no telephone man can conceive of such figures, much less have to pay any of them, but here is where our companies come in.

The corporate income tax is to be increased from 12 to 14 per cent, according to latest Act of the Senate Committee, and exemptions of $3,000 on incomes of less than $25,000 are to be eliminated. This will increase the taxes paid by telephone companies between 4 and 5 million dollars.

Five cents on each telephone message from 30 to 50 cents and 10 cents on 50 cents and above is esimated to bring in 55 million dollars. Then add to this two cents on each check or draft, postage on first class matter increased from two to 3 cents; stock sales conveyances to bear a 1 per cent increase, all of which will effect the telephone interests to the extent of more than 25 million dollars, which is approximately an increase of 66-2/3 percent of all the taxes heretofore paid annually to the Federal government.

While the tax bill provides that this per message tax is to be added to the established rates and paid by the customer, we fear it will be resented in peace times by our patrons and will tend to reduce our toll receipts to a great extent. Our tool business has already declined more than 20 per cent during the first quarter of this year. President MacKinnon advises that he has had more than 200 answers to his recent inquiries from our associated companies indicating that the loss of stations in the first quarter of this year has been as great as the whole of last year and while the toll business decreased 6 per cent during the first quarter of this year, some companies report a loss as high as 50 per cent. Therefore, there is no telling what our loss will amount to in toll service if this tax goes on. Someone estimated the toll loss to be as much as the Government will accrue from the tax, and that may not be far wrong.

It is estimated that the bill as passed by Congress and now before the Senate will produce $1,310,000,000 in taxes by June next, but this still leaves a deficit of $4,315,000,000 to be raised by bonds and treasury borrowings to be paid ultimately by other forms of taxes.

Federal Salaries

There is always a hue and cry of cutting federal salaries and reducing governmental expenses to help balance the budget. There are more than 60,000 employees on the Government payroll in Washington city alone, and it is estimated there are more than one million five hundred thousand present on the government payroll elsewhere within these United States. Multiply that by five per family and we have practically 1/15th of our population directly and indirectly effected by this movement, and salaries are just not going to be reduced to any appreciable extent.

Melvin A. Traylor in his speech before the Kentucky Legislature under date of March 10, sets forth in a few striking statements the magnitude of the tax problem that confronts the country. "Business concerns and individuals must contribute approximately $35,000,000 a day to state and local governments and $13,000,000 a day to federal government before they can make anything for themselves. About 20 cents out of each dollar of income is required to carry on our multiple governing bodies. Only a short time ago, one out of every 22 persons gainfully employed was on a public pay roll; today it is one out of every 11; and it is said that at the present rate we shall in only a little over 20 years have one person on the public pay roll for every individual paying taxes.

The most liberal estimate of reduction proposed by this measure is from 200 to 225 million dollars and that is not a drop in the bucket compared with the deficit. It now appears from the way the House is acting that this salary reduction bill will not fail altogether. On last report it had been reduced to $55,000,000—one-fourth of its original intent.

Affects Telephone Industry

Now let's see what effect this reign of extravagance in governmental expendiutres has had on our business. Prof. Herbert B. Doray of the Northwestern University in an article published in October 1926 states that the Class A companies represent 97 per cent of the telephone earnings and finds as follows:

Year	Opr. Revenue	Taxes	Pct.
1916	$283,174,890.00	$15,710,912	5.55
1925	791,507,221.00	61,627,223	7.79

But bringing the figures down to 1930, five more years as taken from the report of the Interstate Commerce Commission, reflecting all the revenues of A, as well as B and C companies reporting, we have as follows:

Opr. Rev.	Taxes	Pct.
$1,209,664,793	$92,854,847	7.68

showing a slight decrease in percentages on account of the addition of the Class B and C companies, which operate in smaller towns and cities and for that reason and on account of local influences does not pay as much as the larger Class A companies.

This enormous tax means that the telephone companies as a whole in 1930 paid $5.46 on every telephone station in operation and $7.68 on every $100 received, but a later compilation from good authority shows that the Class A companies in 1931 paid $8.25 on every $100 received.

Former President Calvin Coolidge in the Saturday Evening Post of March 26 states that railroads of the country paid $6.30 per hundred dollars in 1929—one of their good years—which shows that the telephone companies are paying at least their just share of the taxes. Mr. Coolidge points out that returns from many thousands of owner-operated farms in all parts of the country show that the average tax for the six years 1922-1927 was 26.3 per cent of the net income and that even in their best years the railroads were paying about 25 per cent of their net operating income for taxes. It is interesting to note that in the year 1931 the operating income of Class A companies was $712,291,936 and taxes amounted to $95,408,305 and that the ratio between these two figures was 35 per cent. That is $5.65 on each and every telephone station in operation during that year, including switched or service stations as well as company owned.

It appears inescapable that the tax bill for the year 1932 of the telephone industry in the Southeastern states will be close to $10.50 out of each $100 of revenue. Individual companies, for one reason or another, may better this figure, but my estimate is $10.50 for the industry as a whole. Federal taxes will be increased and no important steps have been taken in any of these states which would lessen the tax burden on telephone companies. By reason of advalorem taxes on property, which taxes are more or less stabilized, and by reason of reduced revenues at a time of business recession, we will need to give consideration to the larger amount of the gross being paid as taxes.

Cost of Government

Governor Roosevelt in his address before the University of Virginia under date of July 6, 1931, points out as one reason for the enormous tax of the country, that there are 500,000 units of Government, Federal, State and Local, and in New York alone there are 13,544; that local governments in the nation in 1890 cost 487 million dollars but by 1927 it had grown to $6,454,000,000, from a per capita of $7.73 to $54.41. In one local county, taxes had increased from 337 thousand dollars in 1900 to 22 million dollars in 1929. The property value in that space of time increased 35 times, while taxes increased 65 times.

Mr. Coolidge in his Saturday Evening Post article in summing up the nations cost finds that 13 billion 48 million dollars were expended for 1930 and that more than 7 billion, or 53 per cent of it went for local governments.

In the contemplation of our tax problems we seem to lose sight of this enormous local side of the question which is increasing more rapidly than any other unit.

Our hope for the future lies in economy in government expenditures, not alone in federal and state, but local as well. By economy I mean the conduct of the affairs entrusted to public officials in the manner that a prudent business man would conduct his own affairs, and more especially, local units, as the tendency leans toward a run-away in expenditures, in that department.

We know from hundreds of years experience that in the long run business can only afford a certain average interest rate. Likewise we know that business cannot afford more than a certain percentage of its revenue as taxes and continue in business. Taxes greater than that amount will stifle business, bring it to a stand-still, and in many instances cause it to diminish and cease.

Unless we put all our shoulders to the wheel, cooperate to the fullest extent with our President and our respective officers and officials we will find ourselves buried under an avalanche of taxes from which, like the railroads in their dire extremity, it will be difficult to extricate ourselves.

POSSIBILITIES OF NEW RADIO-TELEPHONE

If Marconi's new radio-telephone lives up to the expectations raised in its successful test it may be that the portable wireless telephone has come into being. Utilizing ultra-short radio waves, the new instrument is said to be capable of communication with any telephone within 100 miles, and not, as in previous devices, only with radio receivers.

The inventor expects to refine his device to portable size, and thus he will make possible a great forward step in the world's communication. For instance, a motorist, running out of gasoline on a rural road, would not need to tramp miles to a filling station or a telephone; he would simply order fuel through his traveling transmitter, and wait for its delivery. If perfection brings greater range, the explorer in the wilderness, the traveler at sea, the aviator on a distance flight, will be able to converse with family and friends in their homes.

The telephone brought a revolution in communication, but, with all its improvements, has had to remain in a fixed position. Marconi, who gave wings to words when he invented wireless telegraphy, now seems to have hit upon something that will bring the world's inhabitants still closer together by giving wings to the telephone.

NEW ZEALAND INTERNATIONAL TELEPHONE EXTENSIONS

A radio-telephone service between New Zealand and Germany, Belgium and Holland was opened recently. The institution of the new communication follows the radio-telephone service with Britain, opened recently. The calls are made through Sidney, where the New Zealand-Australian circuit is connected with the Australia-Europe system.

BROWN HEADS NORTH DAKOTA ASSOCIATION

H. A. Brown of Cooperstown was elected president of the North Dakota Telephone association at the close of the two-day convention held at Fargo, N. D., May 27 and 28. A. S. King, of Minot, was chosen vice-president, and D. L. Vail of Milnor was re-elected secretary-treasurer.

Mr. Brown succeeds A. H. Bakken of Mayville, and Mr. King succeeds J. G. Odegard, of Washburn.

Named to the board of directors were Mr. Bakken, F. A. Schonburg, of Bethold, and Mr. King.

Telephone Activities in Foreign Countries

Dispatches from Abroad Keep Telephone Men in United States Constantly Informed Concerning Telephony of the World; Domestic Telephone Problems Oftentimes Can Be at Least Partially Solved by Watching the Outcome of Experiments Made Elsewhere

Proposed Consolidation of Finnish Telephone Network

The Finnish Minister of Communications is preparing a bill for presentation to the Riksdag with the object of concentrating the entire telephone network of the country in the hands of one company by the absorption of the existing State-owned lines and those of the different companies, according to The Electrical Review. Hitherto two foreign companies, one of which is Swedish, have sought to gain influence in the telephone industry through the acquisition of shares in the less important companies.

Batavia Radio Amateur Invents Radiotelephone Device

The Batavia (Java) radio amateur, W. P. G. van der Horst, an electrotechnical engineer, has obtained a patent in England on an invention which makes the transmission of several radiotelephonic conversations with one transmitter and permanent wave length possible, according to a cable to Batavia, Java, from the Hague, received recently by Aetna News Service.

Long-Distance Telephony in Kenya Colony, East Africa

After 15 months' work, Nairobi, East Africa, has been linked up by telephone with Mombasa, 320 miles away. The new line was formally inaugurated on February 2 across miles of practically uninhabited game country. Nairobi is already linked with various up-country centers, while Mombasa is connected with other coastal towns, so that it is now possible, for instance, to talk across the 664 miles from Njoro to Dar-es-Salam. As a result of past experience the telephone overhead-line standards have been made very much higher than was previously the case, to avoid the possibility of the wires being carried away by giraffes.

French Decree Authorizes Issue of Loan

A decree published in the Journal Officiel, Paris, France, of January 31, 1932, authorizes the issue of a loan of a nominal capital of 2,600,000,000 francs, in bonds bearing 4½ per cent interest, for the needs of the annex budget of the Posts, Telegraphs and Telephones. These bonds will constitute a new section of the 4½ per cent loan authorized by the decree of June 13, 1928, and the ministerial decision of April 25, 1929.

They will therefore be amortizable, by purchases on the Bourse or by drawings, in 27 years at the maximum, beginning from May 15, 1932. Advance redemptions may be made beginning from May, 1933. The bearer bonds will be delivered in denominations of 500 francs, 1,000 francs and 5,000 francs, and the registered in denominations of 500 francs, of 1,000 francs or a multiple of 1,000 francs.

A Ministerial decision published in the Journal Officiel of February 1-2, 1932, fixes the issue price at 496.50 francs per 500 francs of nominal capital, and states that subscriptions will be opened February 5. (One franc equals approximately $0.0392.

Japan Plans Telephone Service With Korea and Manchuria

Telephone communication between Japan and Korea is to be made possible soon, according to an announcement by a Ministry of Communications engineer. It is planned to use the existing cable between Shimonoseki and Fusan for the undersea section of the system. This plan has long been under discussion but was taken up seriously only after the recent incidents in Manchuria.

Experiments conducted already between Shimonoseki and Fusan have proved a complete success. Mr. Shoji, an engineer of the Ministry of Communications, returned to Tokyo from Fusan recently and reported that regular telephone communication can be established with a few simple additions to the existing telegraphic apparatus. He said that he had already succeeded in establishing one-way communication between Fusan and Tokyo and between Shimonoseki and Seoul.

According to Mr. Shoji's estimates, an appropriation of about 100,000 yen, (about $50,000), will be sufficient to cover the cost of the additions necessary and the extra relays required for direct service between Tokyo, Seoul, Dairen and Mukden.

Poland Agrees to Automatic Telephone System

The Polish Parliament has passed the laws necessary for granting a contract to Telephone and General Trust, Ltd., of London, in conjunction with its affiliated company, the Associated Telephone and Telegraph company of Chicago for conversion of the state-operated telephone system of Poland to the Strowger Automatic system. The contract involves the expenditure of more than $3,000,000 for the initial outlay and provides for the furnishing of supplies and granting of an international credit over a period of 12 years by the British-American group.

Telephone Rates in Prague (Czechoslovakia)

Telephone rates in Prague are about $2.30 monthly plus 1.2 cents per call. The high installation fee ($30 to $60) tends to discourage the use of telephones in residences.

Automatic Timer for Calls in England

The telephone section of the Post Office department and its engineers are working ceaselessly upon the problem of removing the human factor so far as possible from its service. At the end of the year they expect to have in operation at the Carter-Lane, E. C. buildings, a device which will do away with all question of queries about the length of a trunk call. Carter-Lane is the trunk exchange for the greater part of London.

A clock will be set in motion as soon as the subscriber is connected with the trunk call. The clock will not have a face, but will operate a series of lamps, one of which warns the operator when every three minutes has expired. When the subscriber has finished the conversation and replaces the receiver, the device automatically stops, so that even should the operator be too busy at the moment to attend to it, there can still be no doubt about the time the connection ceased.

For years, according to a United Press dispatch from London, England, Londoners have been trying to get the telephone service out of the hands of the government and put into those of private companies. The late Labor government felt this was inimical to its Socialistic tenets. But now some 320 members of Parliament have signed a petition paving the way for the change and has sent it to the Prime Minister.

Conquering STORM and TIDE

Cable from hold of ship passes through series of guides to "stern sheave"

Enormous rollers built into the bow and stern of the cable ship

A HUNDRED MILES of ocean, whipped by gales and treacherous currents, separate Key West from the Island of Cuba. Down in the black depths—in one place a mile beneath the surface—down where no faintest light ever penetrates, and where the pressure is so terrific that only grotesque shaped deep-sea fish can live—a slim line of telephone cable runs along the ocean floor. It has made instant speech between Havana and the United States an every-day fact. But it took months of hard, adventurous effort to put it there.

Before the line could be laid, a special type of cable had to be constructed, thoroughly insulated and heavily armored to protect it from the wear and tear of the rough sea bottom. This cable—half a million feet in length—was carefully coiled in huge receiving tanks in the hold of the cable ship *Neptun*.

Slowly and steadily, day and night, the steamer plowed out to sea, paying out the cable over an enormous roller, called the "stern sheave." To hold her course true against wind, tide and current, observations were constantly taken. And as a further precaution large lighted buoys were anchored at twenty mile intervals along the charted route.

As the ship approached the Cuban coast a tropical storm of almost hurricane proportions blew up from the Caribbean. A lashing wind and mountainous waves made it impossible for her to ride out the gale safely. The cable had to be cut, and its position marked by a buoy.

Several days later, when the storm had subsided, the steamer returned, the buoy was picked up and the cable spliced. In Havana Harbor the final section was laid, and the linking of Cuba with the mainland of America was complete.

Today the telephone has made a great part of the world one neighborhood. About 92% of the world's 32,750,000 telephones can be reached directly from any telephone connected with the Bell System. And year by year important engineering feats extend this service—make it still more efficient—still more useful—at a cost so low that it is available to every home.

A BELL SYSTEM ADVERTISEMENT

Telephon told

An Advertisement

American Telepho

Telegraph Co

Tales of Adventure to a Juvenile Audience

ONE of the amazing things about boys and girls is the speed with which they grow up. Today, they're in grammar school, high school. Tomorrow, they're getting married, making homes . . . and having telephones installed!

To win and keep the friendship of this fast-moving, fast-growing generation, advertisements like the one on the opposite page are appearing regularly in juvenile publications. Simply, directly, they present the adventurous side of telephone engineering and construction. This one, for example, makes the laying of a cable from Key West to Cuba a story to stir young imaginations—then leads into an explanation of the scope, efficiency and usefulness of today's telephone service.

Readable, interesting advertising of this kind should create, among future telephone subscribers, a lasting respect for the entire telephone industry.

Telephones and Radio at Conventions

For the First Time in History the Public Was Able to Listen in on a National Convention with all the Comforts of the Home

The two National political conventions held in Chicago during June demonstrated the real worth of the telephone and the radio. With this combination millions of people throughout the United States and other countries followed the proceedings with accuracy, actually hearing the voices of the different speakers as the proceedings were broadcast during practically every minute the conventions were in session.

On the opposite page is shown the apparatus furnished by the Illinois Bell Telephone company as their contribution to the success of the move.

Microphones at Several Locations

On a stand in front of the speakers' platform were four microphones, which picked up speeches from the platform. These microphones, with others set up in various parts of the convention hall, were controlled from the booths. NBC had two parabolic microphones, one set up at either corner of the speakers' platform, to pick up speeches from any part of the floor, as well as the noise of demonstrations. Columbia had five Western Electric microphones set up at various locations around the hall. All microphone locations were connected with the control booths by telephone, so that announcers, directors and engineers were in constant communication with each other. Telephone talking circuits also connected the control booths with the main studios of the chain systems and local stations downtown, and with their temporary studios located beneath the speakers' platform, which were used for broadcasting informal talks by celebrities.

Columbia provided an innovation at the Democratic gathering in the use of several "lapel microphones" on the convention floor. This device, of Western Electric manufacture and demonstrated in Chicago and other Illinois cities last fall by S. P. Grace of Bell Telephone Laboratories, is a miniature transmitter amplifier. At the convention, when a delegate wished to address the chair from the floor, a page brought a lapel microphone to him on an extension wire and hooked it to his coat lapel. As he spoke, the device picked up the vibrations of his chest and the acoustic vibrations through the air in a proper balance, and carried them to the loud speakers and radio circuits. This was perhaps the first time that this recent Bell Laboratories development was put to commercial use before so large a gathering.

LINK UNITED STATES WITH SOUTH AFRICA

Regular radio-telephone service between North American telephones and South Africa began June 1, according to an announcement of the Indiana Bell Telephone company.

Conversations will be handled through the transantlantic radio telephone stations of the American Telephone and Telegraph company, working with the British post office stations in England where the calls will be switched to the London-Cape Town radio circuit. The total length of the circuit from New York to Cape Town is about 9,500 miles.

All Bell system telephones in the United States will come within the scope of the service, together with Bell connecting telephones in Canada, Cuba, and Mexico.

At the beginning the daily service period will be from 1:30 a. m. to 6:30 a. m., Central standard time, corresponding to 9:30 a. m., and 2:30 p. m., in Cape Town. Later it is hoped to extend these hours.

Previously a single African city, Ceuta, Spanish Morocco, could be connected with North America, over cables spanning the Straits of Gibraltar and land wire links to the radio terminals in Great Britain.

RECENT STATISTICS ON WORLD TELEPHONES

The United States not only has more telephones than all the rest of the world combined, but excels as well in the number of telephones relative to population. There are 16.4 telephones for each 100 persons in the United States, as compared with only two telephones for each 100 population in Europe. Canada is the only country whose telephone density approaches that of the United States, with 14 telephones for each 100 persons. Next in order are New Zealand with 10.2, Denmark, 9.9, Sweden 8.7, and Australia 8.1. Germany and Great Britain stand in ninth and tenth position with respect to telephone density, with 5 and 4.3 telephones for 100 persons, respectively.

In excess of two-thirds of the world's telephones are operated by privately owned systems, reflecting the relatively heavy American development. All telephones in this country are operated by private enterprise and roughly four out of five telephones in Canada are under private operation. Of the approximately 10,600,000 telephones in Europe, only 1,354,000 are privately operated, the balance representing government systems.

There are approximately 35,340,000 telephones in the world, of which number the United States has 20,202,000. In the absolute number of telephones, Germany ranks next to the United States, having 3,249,000.

The facts cited above are taken from "Telephone and Telegraph Statistics of the World—January 1, 1932," prepared by the American Telephone and Telegraph company.

He: "You were no spring chicken when I married you."

She: "No, I was a little goose."

AUTHORIZE PURCHASE OF TELEPHONE FIRMS

Purchase by the Illinois Home Telephone company, Jacksonville, Ill., of the properties and assets of the Illinois Telephone company, Jacksonville, the Boynton Telephone company, Pleasant Plains, and the Home Telephone company of Bluffs, has been authorized by the Illinois Commerce commission.

For these properties the purchasing company will make the following payments:

To the Illinois Telephone company, $1,024,600 of its common capital stock and assumption of payment of $185,000 of outstanding notes and all other liabilities of the Illinois Telephone company except capital stock liabilities.

To the Boynton Telephone company, $105,100 of its common capital stock and assumption of all its liabilities except capital stock liabilities.

To the Bluffs company, $27,200 of its common capital stock and assumption and payment of $8,100 in outstanding notes and other liabilities except capital stock liabilities.

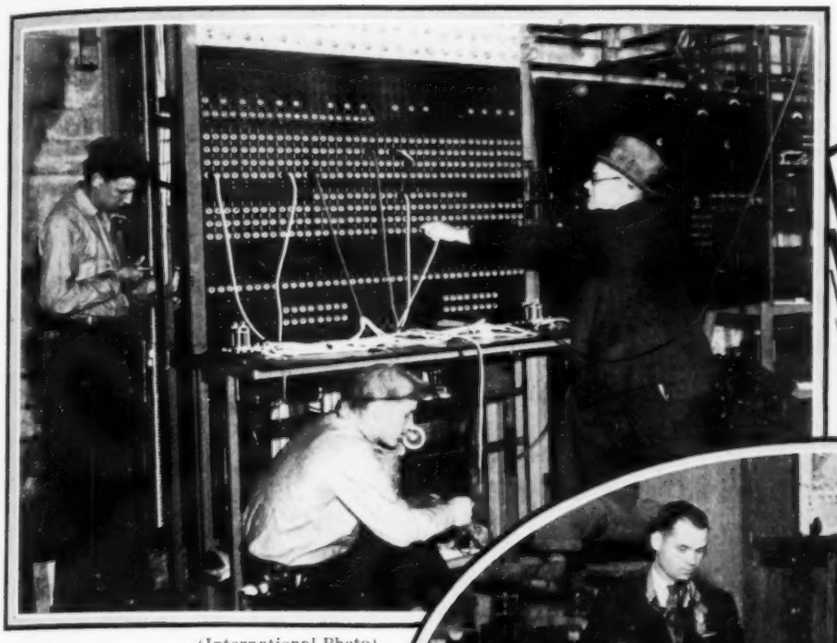
Rates of service now charged by the selling companies were ordered to remain in effect.

The Illinois Telephone company operates exchanges in Jacksonville, Alexander, Literberry, Murrayville, Woodson, Carrollton, Greenfield, Hillview, Patterson, Roodhouse, White Hall, Manchester and vicinities. The Boynton company operates in Pleasant Plains and New Berlin. The Bluffs company operates in Bluffs and Meredosia.

CUBAN TELEPHONE CO.

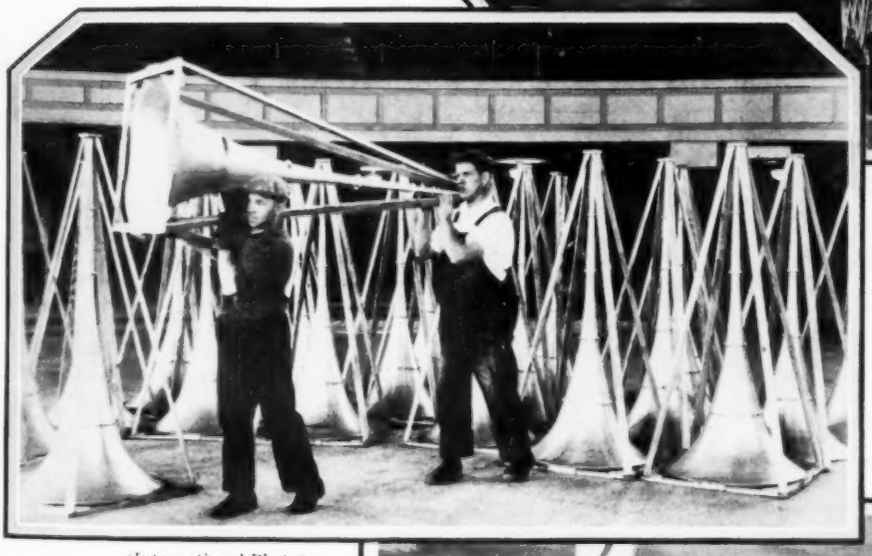
The Cuban Telephone Company had net income of $1,449,493 for 1931, equal to $7.25 per share on 141,421 common shares after preferred dividends, compared with $1,509,537 or $7.67 per common share in 1930.

Broadcasting National Conventions Is Expensive



(International Photo)

Western Union and Postal Telegraph Companies maintained large workrooms in the basement of the Stadium during both conventions, handling a heavy volume of press dispatches, as well as a considerable commercial business. This photograph shows workers installing the telegraph switchboard of one of the companies. Postal leased 39 telegraph circuits from the Bell System for use during the conventions.



(International Photo)

No wonder everybody in the vast Stadium audience could hear the speakers! Here are some of the huge loud speakers, which look like gigantic calla lilies, and which were suspended in cluster fashion from the center of the Stadium roof.

Long Lines loop board in the Stadium basement. Through this board were routed telephone, telegraph and teletypewriter circuits serving newspapers and press associations which reported the conventions. A special 100-pair cable connected this board with the Long Lines Department test room in the Franklin Building, downtown, being routed by way of West Office. Smaller cables ran to the press section, press association workrooms and newspaper workrooms. In the photograph, left to right: Glen Snyder, R. J. Lillis, W. E. Kendall, B. C. Fox and G. H. Brown, all of Long Lines Plant.

Right: Part of the special layout of 28 public pay stations installed on the main floor of the Stadium, to accommodate officials, delegates, newspaper workers and others attending the two conventions. Attendants were on duty at all times to assist customers in placing local and long distance calls. In addition to these 28, there are 39 other public pay stations permanently installed in various parts of the Stadium.

Courtesy of the Illinois Bell Telephone Co.

News From the Field

Four new exchange buildings are to be erected at Columbus, Ohio, at a cost of $220,000.

The Ohio Bell Telephone company plans to expend $100,000 in new cable between Middletown, Ohio, and Dayton, Ohio.

The South East Public Service company of Mocksville, N. C., has moved into its new exchange building, new switchboard will be installed.

The Associated Telephone Utilities company announced that fewer telephones were discontinued in May than the previous month. A gradual decrease over several months is announced.

Effort is being made to tax each station in St. Louis 60 cents per year by the city council. Similar actions are being suggested in other cities.

The Northern Ohio Telephone company has purchased the Huron Telephone company and changes will be made in equipment. P. G. Bishop of Norwalk will be local manager.

The Southeast Mo. Telephone company Jackson, Mo., is having its statements delivered by carrier to evade the new increased postal law.

Cambridge Citizen's Mutual Telephone company, Cambridge, Mass., is laying new cable in that city.

Charter has been granted the Royal (Iowa) Telephone company to operate in that town. Capitalization, $10,000.

The Shorter (Ala.) Telephone company asks the state commission to force the Southern Bell to make physical connection with its exchange for long distance purposes. The Southern Bell has put in toll stations for this purpose.

The Equity Telephone company, Luck, Wis., recently voted to reduce exchange service charges 20%.

The Kempton Telephone company, Kempton, Ind., recently bought by the Tipton Telephone company, is making considerable improvements in their property in the way of rebuilding.

The Illinois commerce commission has approved the sale of the Streator, Ill., Telephone company to the Illinois Valley Telephone company. The consolidation involved in the deal is $998,000.

Recently a receiver for a store in Watertown, N. Y., sold the stock by phone, calling first one bidder then another over long distance. In this way the purchase price was increased.

The Bell Telephone company of Pennsylvania is planning the erection of a $2,000,000 office and exchange building in Philadelphia.

The Wartermelon Telephone company of Benton, Mo., discontinued exchange service recently; the towns of Benton, Commerce, Oran Blodgett and Kelson were effected.

The Galva (Illinois) Telephone company is making extension to its cable lines in that town.

New quarters of the Southern Indiana Telephone company, Salem, were opened to visitors during June. Former quarters were destroyed by fire last March.

Telephone companies throughout the country are being attacked by state commissions upon the surcharge for cradle phones by telephone companies.

The Nebraska Continental Telephone company at Greeley, Neb., is being requested by subscribers to reinstate the old dollar rate. An appeal to the railway commission will be lodged.

Batesville (Ind.) Telephone company gets extension until March, 1933, to complete reconstruction of toll line from Varsailles to Holton, by the Indiana Public Service commission.

Directors of the Lima, Ohio, Telephone and Telegraph company, recently elected Geo. B. Quatman as president to succeed the late E. R. Curtin, Sr.

The Garden Valley Telephone company, McIntosh, Minn., has purchased the Citizens State Bank building which they are remodeling for use as a central office exchange.

The Ohio Bell is expending $25,000 for underground cable construction near Troy, Ohio; the Toledo and Cincinnati lines are being placed under ground.

The city of Waco, Texas, is endeavoring to have the Southwestern Bell reduce rates in that city; naturally the telephone company is resisting such efforts, claiming that rates are not too high.

Taxes on telephone properties in Montana have been practically doubled during the past ten years, according to a report of the state board of equalization. Companies in other states claim they are required to pay approximately 10% of their gross income in taxes.

INDIANA TELEPHONE BULLETIN SUSPENDS

The Indiana Telephone Bulletin, owned and published by the Indiana Telephone Association, announced in its June issue that it would not be published again until conditions improve and advertising revenues had been restored. The Bulletin was a newsy publication and it is unfortunate that it was necessary to discontinue issuing monthly as had been its custom for many years.

EDWIN CARTER KILLED IN AUTO ACCIDENT

Edwin Carter, 22, son of E. F. Carter, vice-president of the American Telephone & Telegraph company, was instantly killed in an automobile accident July 6th, near Brookings, S. D., while on his way to Alaska to spend his vacation.

Accompanied by Walter S. Gifford, Jr., son of W. S. Gifford, president of the A. T. & T. company, he left New York for an overland trip to Alaska. Walter, who is only 14 years of age, was learning to drive the car, when the accident occurred. It is understood he failed to observe a curve in the road and the car plunged into a ditch, jumped a fence and went some distance into a field before it came to a stop. Gifford's arm was crushed but it is believed he will recover.

CUT WISCONSIN PHONE RATES

After a year's investigation of the rates of the Wisconsin Telephone Company, following its demand for a 25 per cent increase in rates at Madison, the Public Service Commission July 1st, ordered a 12½ per cent reduction in rates for all of the 102 communities served by the company.

The reduction means a loss of $1,550,066 for the company in the next twelve months amounting to $849,074 in Milwaukee.

The reduction was ordered on the showing of the investigation so far. The commission estimates that it will take another year to complete its investigation, with a still further reduction probable.

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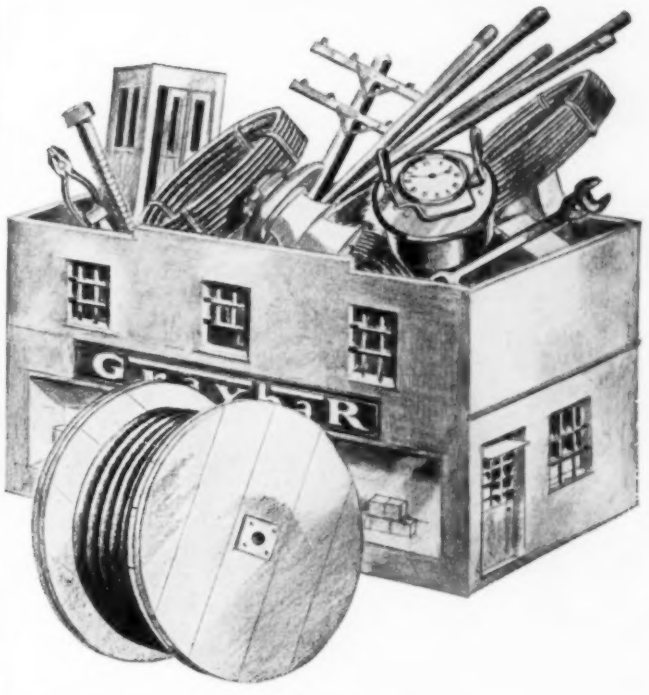

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B. C. BURDEN, Editor

Transformer Computations

Q.—What is the relation between the turns ratio, voltage ratio, and impedance ratio of the transformers and repeating coils commonly used in telephone work?

A.—The voltage ratio is directly proportional to the turns ratio, and the impedance ratio is proportional to the square of the turns ratio. For example a transformer having a turns ratio of 1 to 10 would have a voltage ratio of 1 to 10, and an impedance ratio of 1 to 100. Fig. 1 illustrates these relations in an ideal transformer. It will also be noted that the current ratio between primary and secondary is inversely proportional to the turns ratio.

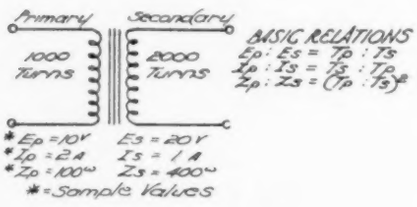

Fig. 1. Basic relations in ideal transformer.

In the communication field it is customary to express impedance characteristics of transformers used in voice frequency circuits in terms of the impedances for which the transformer primary and secondary are designed to work out of, rather than the actual impedance ratio. This is done so as to preclude the possibility of using a transformer having the proper impedance ratio but one which would have insufficient impedance to work with a given load. For example a transformer having ten turns on the primary and 20 turns on the secondary would have the right impedance ratio to properly match up two loads one having an impedance of 1000 ohms and the other 4000 ohms, however, it is obvious that the inductance of the two windings would be insufficient to permit connecting such a transformer to loads of such high impedance.

Brush Treatment of Old Poles

Q.—Is it considered worth while to brush treat with creosote, old cedar poles?

A.—There is a considerable difference of opinion as to the preservative value of the brush treatment of old poles. It is generally agreed that the brush treatment of new untreated cedar poles is of doubtful benefit, due to the fact that the wood fibres are in such condition that they will not readily absorb cold creosote applied with a brush or other similar means. It is the opinion of many, however, that the brush treatment of old cedar poles which have been in service for a number of years is well worth while and that a life extension of from three to ten years is obtained where the treatmnt is properly applied.

The greater life extension obtained by brush treating methods on old poles as compared to new poles is attributed to the fact that the sap wood of an old cedar pole is quite porous and will absorb sufficient creosote to make the treatment effective. The relative economy of brush treatment vs. pole replacement depends largely upon the life extension that can be obtained as against the cost of labor of the more frequent handling of poles. For the smaller companies where labor is cheap there is but little question that the brush treatment of old poles is worth while.

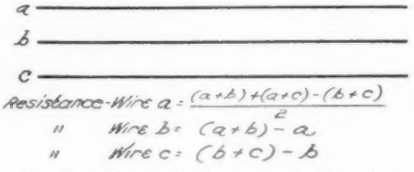

Fig. 2. Determination of single wire resistance.

Insulation Resistance of Open Wire Lines

Q.—What insulation resistance and series resistance unbalance values are standardized by the larger companies for rural and toll open wire lines?

A.—The character of the line, that is, its importance, and whether or not it is used with repeaters or carrier circuits, determines the insulation standards which should be maintained, For high grade toll circuits it is customary to specify 25 megohms per mile as the allowable insulation resistance to ground, and 50 megohms per mile, as the allowable leak between wires. These limits are based on dry weather. For wet weather they are reduced to 1 megohm for allowable leak to ground, and 2 megohms for leak between wires. For ordinary non-repeatered toll circuits, standards of 16 and 32 megohms per mile for grounded and mutual leak is considered satisfactory.

Open wire circuits should be maintained with maximum resistance unbalances between wires as shown in the following table.

Allowable Maximum Unbalance Between Wires of Any Length

Type of Circuit	Allowable maximum Unbalance
Copper phantom circuits	3 ohms
Copper side circuits	2 ohms
Copper non-phantom circuits	5 ohms
Iron phantom circuits	8 ohms
Iron side circuits	5 ohms
Iron non-phantom circuits	10 ohms

Failure to keep the resistance of line conductors balanced will result in crosstalk and inductive interference in many cases.

Computation of Single Wire Resistance

Q.—Please explain the method used in computing the resistance of a single wire when there are several wires on a lead and where only an ohmmeter is available to measure resistance.

A.—The resistance of individual wires can be computed accurately where there are at least three wires present by means of the "triangulation equations". Fig. 2 illustrates how the individual resistance by wires a, b, and c can be determined by means of the equations shown. It will be noted that three measurements are required, viz., the combined resistance of wires a + b, a + c, and b + c.

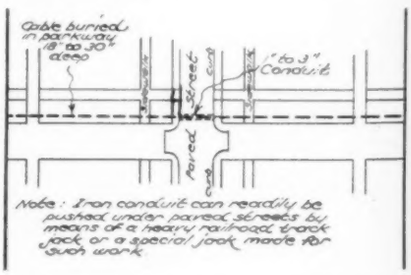
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Fig. 3. Placing buriel cable under paved streets.

Buried Cable Construction

Q.—In buried cable construction where the cable is placed in the parkway between sidewalk and curb, what method is recommended for getting the cable

(*Continued on page 38*)

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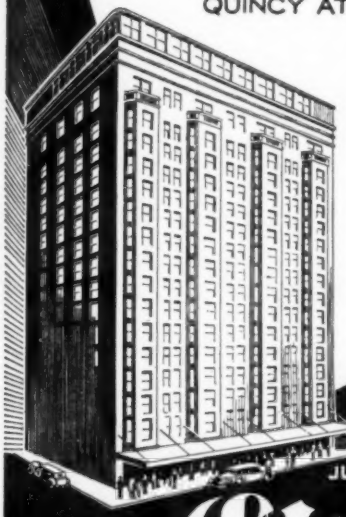

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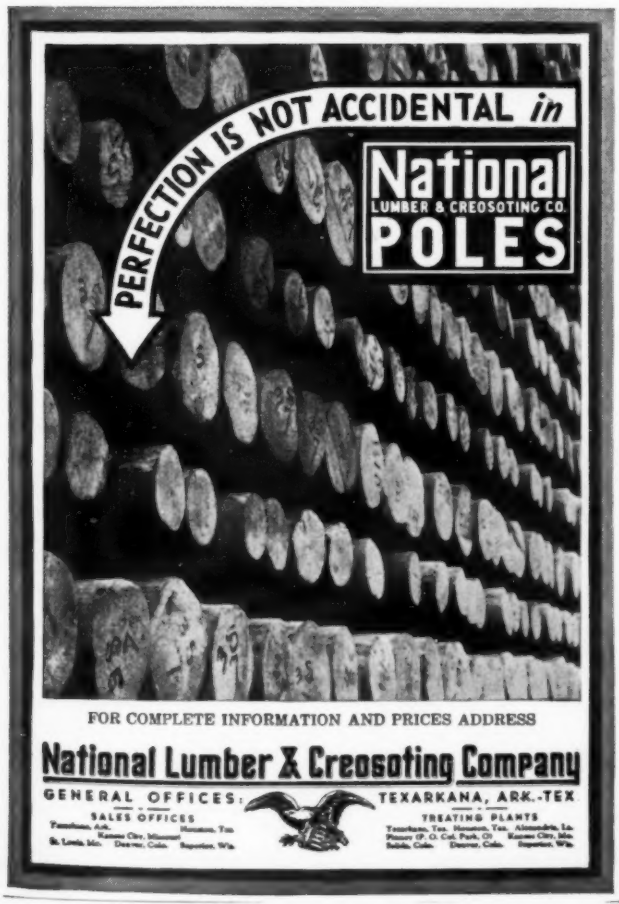

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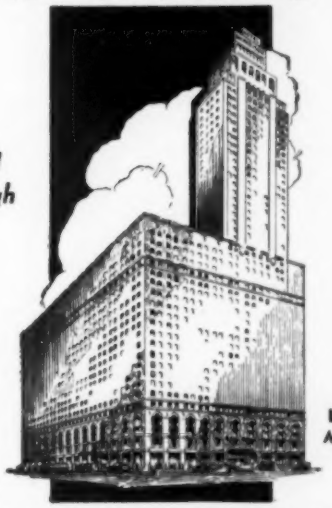

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Speaking Over Radio Made Easier; Tiny "Mike" Fits Your Lapel

By W. C. JONES
Transmission Instrument Engineer, Bell Telephone Laboratories

Many speakers, unfamiliar with the use of the conventional stationary microphone, mar the public-address programs in which they take part by straying away from the instrument. To permit the speaker to move about more

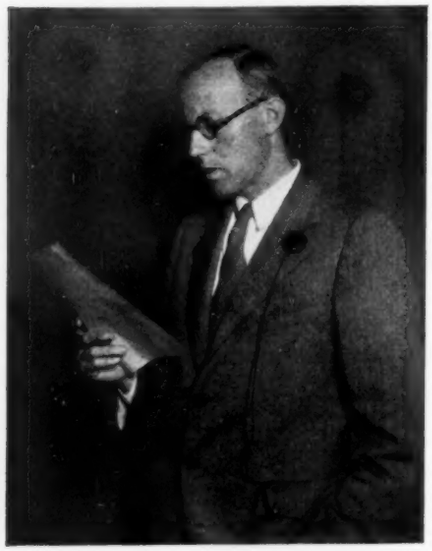

Fig. 1—H. L. Lundberg demonstrates how, when the lapel microphone is in use, the jack and plug are placed in the coat pocket.

freely, a microphone has been developed which is worn on his clothing and moves with him.

This microphone is an adaptation to public address use of the essential elements of a transmitter recently developed for operators. It is only about an inch in diameter and weighs about one and one-half ounces. A thirty-foot length of flexible cord provides the connection to the amplifier of the public address system. The diaphragm is made of thin aluminum, formed into a cone to provide sufficient stiffness to cause it to vibrate as a unit throughout the frequency range of interest.

A number of impregnated paper rings, about four ten thousandths of an inch thick, support the edge of the diaphragm. The dimensions of the recess into which these rings fit are such that the rings separate slightly from one another. This not only provides a resilient support for the diaphragm but also adds a certain amount of damping which reduces the effect of resonance and improves the response characteristics.

Unlike the carbon microphones now in use in public address work, in which the diaphragm forms one of the electrodes, the diaphragm of the lapel microphone is insulated by a coating of phenol varnish from the granular carbon. Electrical connection to the carbon is made through through two stationary cylindrical electrodes, insulated from each other by a ceramic barrier which also serves to define the current path through the carbon.

In order to increase the life of the microphone and reduce the noise which results from moving it about, the space between the electrodes is filled practically full of carbon. A rubber cover-

The microphone described here was used at the recent national conventions. When the chairman recognized a delegate who desired to speak, a page appeared before the delegate with one of the microphones, and the delegate spoke with the mike attached to lapel of the speaker's coat. In this way the chairman could clearly hear a delegate from any part of the auditorium. Proceedings were dispatched with greater speed by this little mike.

ing for the microphone eliminates the disturbing noise which would otherwise result from rubbing against the speaker's clothing, or would be picked up through the clip which is provided for attaching it to the clothing.

The clip is so arranged that the microphone can be attached to either the inside or outside of the breastpocket of a coat, or to the lapel. The latter position is preferable, for it brings the microphone closer to the speaker's lips and increases the intensity of the speech without adding to the interfering noise. In the case of a woman, the clip can be fastened to her dress with a pin. The frequency response characteristics of the lapel microphone compare favorably with those of the stretched diaphragm type now in use. Owing to the smaller size of the lapel model, less sound field distortion is introduced.

When worn on the speaker's clothing, however, the instrument picks up sound as the result of chest vibration in addtion to that reaching it

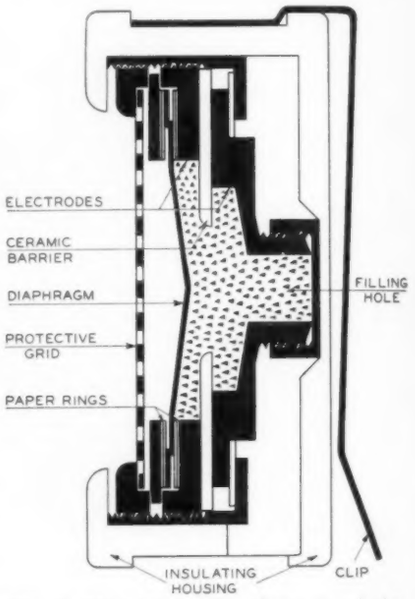

Fig. 2—The lapel microphone is of the granular carbon type, with an unstretched cone-shaped diaphragm of aluminum. The two electrodes are stationary and are electrically insulated from the diaphragm.

through the air. The part due to chest vibration is rich in low frequencies, and if unattentuated results in a "deep" un-

Fig. 3—Associated with the lapel microphone, an input circuit attenuates the lower frequencies which the microphone picks up from the speaker's chest, and prevents clicks when the microphone is cut in or out of circuit.

natural quality of transmission. A special input circuit has therefore been provided for connecting the microphone to the public address amplifier. This circuit attenuates the low frequencies sufficiently to correct for the effect of chest vibration. Provision is also made in this circuit for supplying direct current to the microphone, and suppressing clicks when it is switched in and out of circuit.

Complete equipment, consisting of the microphone, the flexible cord and the apparatus unit which contains the input circuit is shown in Figure 3. The unit shown is arranged for connecting only one microphone at a time and is provided with a lamp which lights when the microphone is connected in circuit and is ready for use. Another unit permits a number of microphones to be connected at one time, of which any one can be selected at will. A plug and jack are provided in the cord so that the microphone can be disconnected if desired. The plug contains a small condenser to prevent the cohering of the carbon granules which would otherwise occur were the plug withdrawn from the jack while the microphone is connected in circuit. When in use, the plug and jack are placed in the coat pocket. This prevents mechanical vibration from being transmitted through the cord to the microphone and introducing noise. S. P. Grace was the first to use this microphone. His audiences have marveled at the loudness and clearness with which his voice reached them, even in large auditoriums, and for the most part have been unaware that he was using a microphone. They have only realized its part when he called to their attention that he had concealed the microphone in his coat pocket, and the cord by passing it down his trouser leg. The portability of the instrument has enabled him to move about freely while demonstrating his apparatus, in a way which would otherwise have been quite impossible. It is expected tht the lapel microphone will find application in churches, convention halls, banquet rooms, lecture rooms, and the like. The instrument will be a boon to speakers who depend on gestures for effective delivery, who must turn to explain lantern slides or use a blackboard, or who find it difficult to put their personality into their message if their position is restricted.

"LONE STAR" PIONEERS ELECT OFFICERS

L. C. Smith of Dallas, Tex., was chosen president of Lone Star Chapter 22, Pioneers of America, at the chapter's annual convention held May 28 and 29 at the Hotel Galvez, Galveston, Tex.

Other officers elected were: Dar Parkinson of San Antonio, vice-president, and R. E. Felix of Dallas, secretary-treasurer. Trustees were elected as follows: E. N. Hall, Galveston; R. E. Compton, Austin; Mrs. Maude Sneed Fort Worth; and R. E. Caldwell, Dallas.

A resolution was adopted favoring the preparation of a history of the telephone business in Texas in line with a national history now being prepared by the national organization of Telephone Pioneers. The following committee to collect data was appointed: W. M. Gilker, Dallas, chairman; J. S. Trapp, Fort Worth; W. H. Walker, Houston; M. C. Brown, San Antonio; J. M. Pierce, Dallas; J. F. Anderson, Fort Worth, and W. B. Milton, Austin.

ASSOCIATED TELEPHONE REPORTS INCREASED GROSS

Associated Telephone Utilities company, the largest unit in the independent telephone field, reports larger gross earnings for the twelve months ended April 30 than for the preceding twelve months. Gross for the period was $17,301,540 compared with $16,221,038. Balance before depreciation was $2-828,159 compared with $3,344,615.

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Telephone Accounting and Depreciation

State Commissions Should Require Small Telephone Exchanges to Set Up Depreciation Accounts in Order That They Can Maintain Their Service Over a Period of Years, According to William H. Phipps, of Columbus, Ohio (Former Telephone Company Owner)

In connection with operation of telephone companies, may I preface what I am going to say by referring to the fact that I built a telephone plant nearly thirty-seven years ago at Paulding, Ohio. When I proposed to build the plant it was said to me that I could not get sufficient subscribers. However, I went out to call on residents of the town, and in two days had secured eighty-seven subscribers. This was sufficient to serve as a nucleus for my telephone company, and immediately I secured a franchise and began construction of the plant.

We put in a board for 300 drops and thought we had covered the situation permanently. Shortly thereafter I sold my interest in the company, and it was not long until a new switchboard was required, to care for the rapidly increasing number of subscribers, and this time a much larger board was installed. This was repeated twice in succeeding years. Each time the board was enlarged, and finally it was also changed from a magneto system to common battery. All this caused considerable expense.

Of course the discarded boards were sold, but not enough was realized to reimburse the original expenditure of the discarded board. In my judgment, capital investment should be given credit for the amount received for the old board, either as an allowance on the new board, or an outright sale, and the original charges should be carried as capital investment, less the credit for the amount received for the old board.

Depreciation and Emergency Accounts

However, if a depreciation account is carried, as it should be, then the amount of depreciaiton charged against the cost of the old board should also be placed as a credit against the cost thereof. Depreciation should always be set up and in addition there should be an emergency item carried.

Sleetstorms, windstorms, and other unusual causes of injury to plant wires occur with too much frequency to be ignored. Then there are fires which injure plants, central office equipment, wiring and stations. I have seen wiring badly broken, lying on the ground and otherwise injured, because of a fire destroying either the building in which it was located, or a building standing near the lines, in both cases of which falling walls struck against the poles and wires breaking the wires and burning the pole. All these injuries cannot properly be charged to depreciation, but should be charged to emergency or some other properly headed account, and paid for out of this emergency fund. What telephone plant has escaped all the sources of damage, which do not properly come under the head of depreciation?

Most small plants are magneto and in congested districts magneto plants are almost impossible to operate properly and satisfactorily. Especially is this true where power and light wires have been installed frequently too close to telephone lines. I have in mind particularly the territory east of Cleveland, Ohio, where may small exchanges are giving poor service because of interference with high current wires of the Cleveland Illuminating company. I know some places where the telephone wires have been moved across the road, but that is not sufficient to give satisfactory service.

Commissions Should Require Depreciation Account

In the system of accounting required by public utility commissions small exchanges are not required to set up a depreciation account, and in this they err considerably, for all telephone plants depreciate, and especially is this true in small magneto plants which sometimes use native grown timber for poles and a low grade of iron wire.

As a rule such exchanges do not set up a depreciation account and when the poles begin to rot and fall, and the iron wire to rust, the company finds itself with no money with which to replace either poles or wire. Accordingly the system goes from bad to worse and subscribers fall off until the system cannot possibly be maintained in proper condition.

In the meantime the company has charged very low rates, and has convinced itself that other companies are charging entirely too much for their services. With many such organizations the day of reckoning is at hand, and these small exchanges must engage new capital and rebuild or they must discontinue.

I know of one Ohio exchange that at one time listed 150 stations and now has fewer than thirty-five stations in actual operation. Practically all its poles lean and many are down. The wires are [illegible] and at some places lie on the [illegible]. The switchboard is very old. I [illegible] how the company can possibly [illegible] expenses.

[illegible] a [illegible] by an attempt at [illegible] so small a charge. When [illegible] was new, the company seemed prosperous, everything was running fine and dividends were paid regularly to stockholders, the majoirty of whom were subscribers, and its managers believed they could continue to do so indefinitely. But when troubles began, finances ran low, and service consequently became poor, these same stockholder-subscribers one by one began to drop away from the company, thus aiding in the destruction of their own plant.

Fix Minimum Charge

The remedy for such a situation is to have the commission fix a minimum charge that will be sufficient to keep a telephone plant in good operating condition, and require that such plant be *kept* in good condition. In an instance when this is not done, the commission itself should take steps to place the exchange in good condition. The matter of reasonable dividends on the capital invested is important, but that must depend on those who manage the plant.

This brings us to a discussion of what may be a reasonable charge for telephone service. Personally, I do not see how a small exchange can be operated for less than $1.75 monthly rental charge, and if those having the investment are to be reasonably compensated for the money invested, a minimum of $2 per station per month would be more to the point.

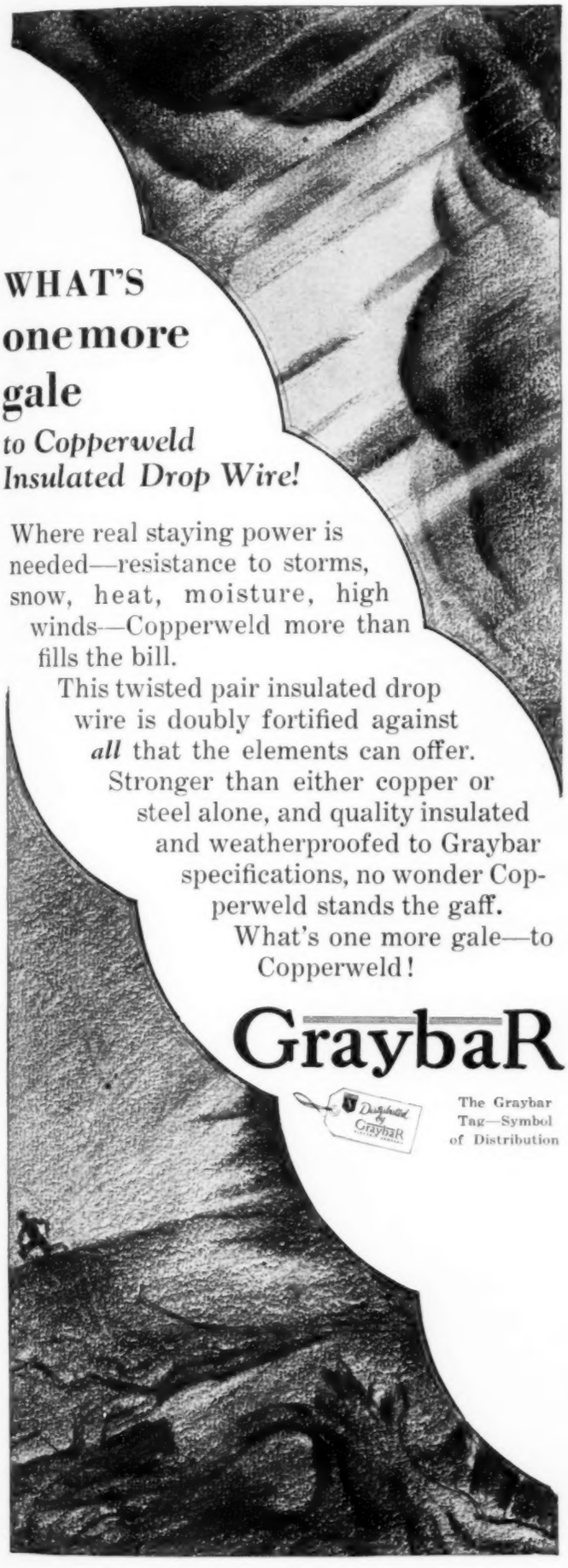
Many rural exchanges have lost heavily because of financial conditions among subscribers, and hence a large number of rural exchanges will show a loss for 1931, even although they have set no charge for depreciation.

Rural Residents Need the Telephone

It is being urged that no increase in rates of rentals should be made now because of the financial condition of the country, and that should be carefully considered, but the question arises, can the rural resident do without the telephone? We think not, for the matter of current prices for his products is important to him, and his isolation makes it imperative that he have some quick means of communication.

Telephone men with run-down exchanges should revamp their accounting, and charge a reasonable depreciation, and should arrange for an emergency fund, as well as a depreciation fund. If not already a common battery system, it should be converted into one, and all the lines should be put into good condition. With

(*Continued on page* 34)



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By J. C. Snyder, Sales Engineer, Stromberg-Carlson Telephone Mfg. Company

The largest and most impressive opening of a new telephone office ever held by the United Telephone Company of Pennsylvania was conducted when that company's new headquarters in Waynesboro was formally opened recently. 5300 citizens of Waynesboro and vicinity passed through the new offices and inspected the new, modern and up-to-date Stromberg-Carlson telephone equipment.

The general enthusiastic acceptance of the new offices and equipment certainly is a reflection of the popularity and integrity of the United Telephone Company personnel and an indication of the esteem in which it is held by the Waynesboro public.

The new offices, modern design, are complete in every detail. The business office is described by Waynesboro residents as the most beautiful in the Valley and many persons who have traveled extensively, say that it is the finest office of its type they have ever visited.

Everything from the beautiful bronze and glass front to the extreme rear of the telephone offices located on the first floor of the new eight story structure of fireproof construction is new and entirely different from anything ever seen in Waynesboro.

Unique in design, the large window in the front of the telephone office attracts the attention of every passerby. Decorative plate glass panels are set in solid bronze panels. Colored "U" shields and hand set telephone designs have been worked into the glass.

Top: Ralph Van Trine, executive vice President. Seated: Harry Faris, R. M. Williams and George H. Culp, installers at Waynesboro, Pa., of the United Telephone Co. Standing: C. L. Nichols, Stromberg-Carlson installer, Lloyd Fetterolf, J. E. Stahl, William Moore, Robert Vottey and Gordon Snyder, United Company installers; J. C. Snyder, Sales Engineer, Stromberg-Carlson Company.

Doors are of glass and solid bronze with telephone poles of bronze adding to their beauty.

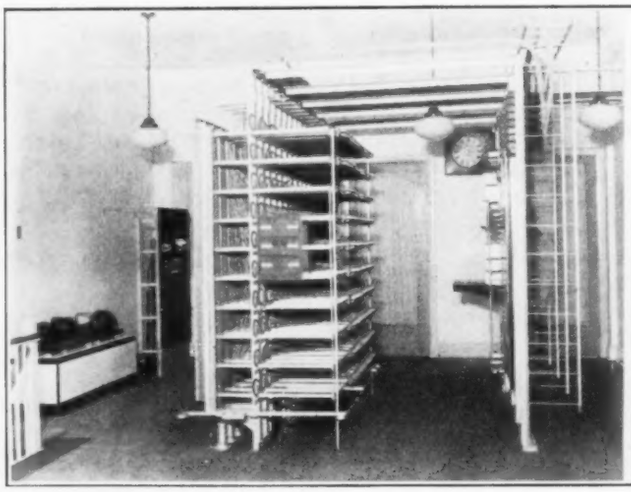
The business office, finished in natural oak, is light, airy and unusually attractive. The floor is covered with green linoleum of the latest inlaid pattern. Two walnut desks with chairs to match harmonize well with other furnishings in the office, which include a walnut table and red leather upholstered chairs for the convenience and comfort of patrons.

Wood and glass partitions separate the manager's office and business office. The same type partitions also are used between the business office and central office and terminal room, affording visitors a full view of the entire office.

Entrance to two comfortable, roomy telephone booths is through the business office. Furnished with a comfortable red leather upholstered chair, table, pencil and pad, and a Smokodor, the booths provide every comfort for telephone patrons. Accoustical treatment in the booths make them as nearly sound perfect as possible.

Indirect lighting is used exclusively in the business office. This system of lighting produces an unusually soft and even artificial light.

The ceiling has been specially treated to eliminate echoes and foreign noises and to make the operator's voice more distinct when speaking into transmitters.



Distributing frames and Power equipment installed in the Waynesboro Exchange.

New Stromberg-Carlson super-service switchboard, finished in natural oak, installed in the new telephone exchange at Waynesboro, Pa.

The first long distance toll circuit in Waynesboro was installed in 1883 when Mr. Jacobs applied to the Bell Telephone Company for service. A grounded circuit line from Hagerstown through Smithburg was constructed.

The system has steadily expanded until today it is operating a new Stromberg - Carlson Super Service switchboard, having an ultimate capacity of 3600 lines.

These vast improvements in Waynesboro constitute just one more step in the program carried on by Ralph Van Trine, Executive Vice President of the United Telephone Co. of Pennsylvania, to give United Telephone subscribers the best of service and its employees the greatest comfort possible.

During the three years Mr. Van Trine has been in charge of the United Telephone Company of Pennsylvania, both telephone subscribers and telephone employees have benefitted greatly from the many improvements which have been put into effect by his excellent management.

Mr. Van Trine was a leader in the unification of the Bell and United Telephone Company lines in territory where the two companies were competing. On the night of November 1, 1930, telephone exchanges in eighteen towns where both companies operated were unified, eliminating competition, and at the same time greatly increasing the value of telephone service to all patrons. Many months were spent in preparation for this unification, which is one of the outstanding achievements in telephony in recent years.

In May, 1931, the name of the Cumberland Valley Telephone Company of Pa. was officially changed to The United Telephone Company of Pennsylvania, to conform with the names of other telephone and utility properties controlled by C. L. Brown, Abilene, Kansas.

In the three years which Mr. Van Trine has been in charge of the United interests in Pennsylvania, many telephone properties have been added to the nucleus which the United Telephone Company of Pennsylvania formed. These companies which have been purchased include the Claar Telephone Company, Perry County Telephone and Telegraph Company, Bedford-Fulton Telephone Company, Morrison's Cove Telephone Company, Milroy-Reedsville Telephone Company, Belleville Telephone Company, Allensville Telephone Company, numerous other small companies in Pennsylvania and the New Jersey Telephone Company, with headquarters at Flemington, New Jersey.

Hundreds of miles of toll line, pole and cable lines have been built in this short period to provide better facilities for telephone users, and to connect the increasing number of United Exchanges.

Keeping step with the purchase of additional subsidiary companies, and the growth of toll lines, was the purchase of exchange properties. In Carlisle, Mt. Holly Springs, New Oxford, Bedford, Roaring Spring, Loysburg, Reedsville and Duncannon properties were bought and modern telephone offices and exchanges built.

Modern plant and exchange equipment was not overlooked in the rapid development of the United properties in Pennsylvania under Mr. Van Trine's leadership. Installation of new exchange equipment was completed in fourteen communities. The towns which have profited from these improvements are Waynesboro, Hanover, Gettysburg, Carlisle, Chambersburg, Mt. Holly Springs, New Oxford, Biglerville, Reedsville, Belleville, Roaring Spring, Bedford, Loysburg, and Liverpool.

Working with Mr. Van Trine is one of the most efficient and competent staffs of telephone experts. Included in this group are G. S. Herbert, vice president and general manager; G. E. Twigg, general plant manager; L. R. Thurston, general traffic manager; Ralph Williams, superintendent of equipment, and George H. Culp, district manager wtih headquarters in Waynesboro.

Waynesboro has an estimated population of approximately 12,000 people.

The new nine position Stromberg-Carlson Super Service Switchboard, finished in light oak to match the woodwork in the business office, presents an unusually attractive appearance.

Included in the many features of the new Super Service switchboard to insure quicker and better telephone service are associated line and lamp multiple, machine ringing, operator's secret service, operator's bar, instantaneous ringing cut-off, calling subscriber's ringing control, operator's cut-in, ringing tone, flash recall, and master ringing key control, eliminating the use of individual ringing keys.

The new switchboard has an ultimate capacity of 3600 lines. Although it has nearly three times as many lines as the old switchboard, it does not occupy as much space.

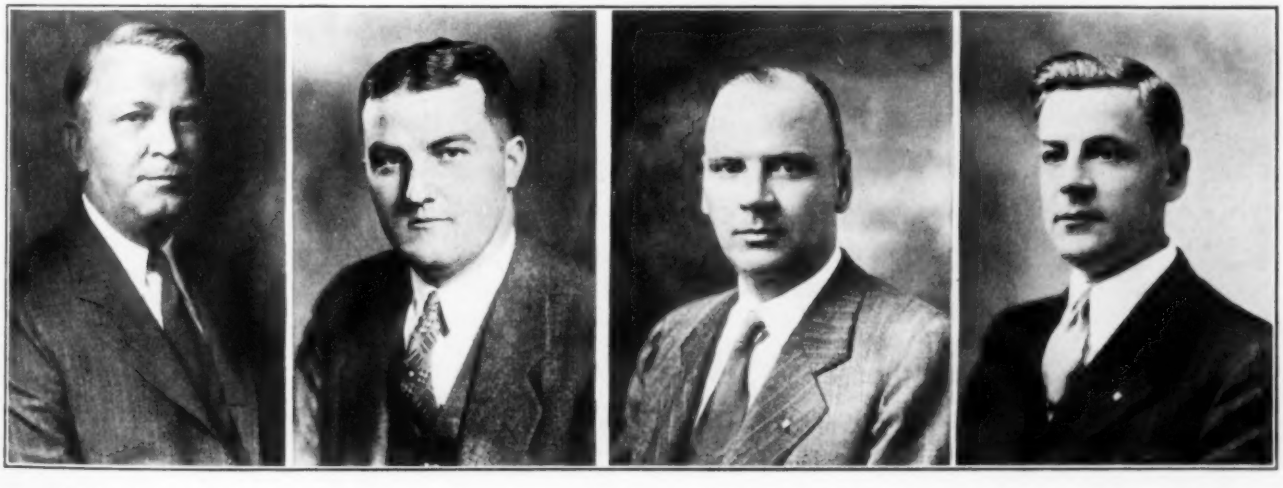
The Chief Operator's desk and other furniture in the new central office has been finished to match the switchboard.

Equipment in the terminal room has been neatly and uniformly installed.

The main frame, tool test panel, wire chief's desk, power board and ringing machines have been placed in a minimum of space, yet they are accessible from all sides.

Five cables, containing 3600 wires, enter the exchange through the basement. Batteries are also in the basement.

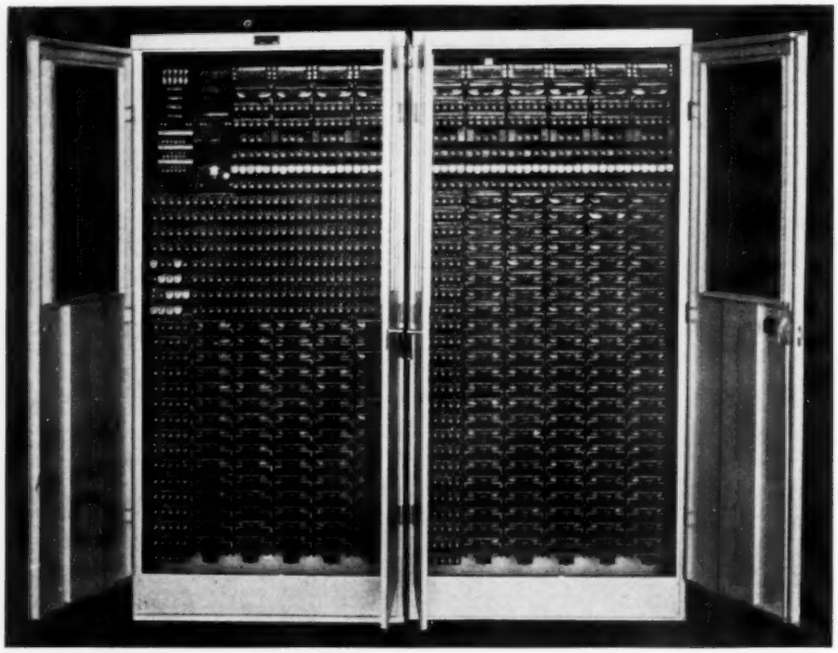
(*Continued on last column of page* 34)



Left to right: G. S. Herbert, Vice-President & General Mgr., United Telo. Co., Waynesboro, Pa., L. R. Thurston, General Traffic Mgr., George H. Culp, District Mgr., Ralph Williams, Equipment Supt.

"All-Relay" Switchboard Purchased for Vermillion, Ohio

Herman E. Hageman, secretary of the Lorain Telephone Co., has announced the completion of plans covering the modernizing of the exchange system at Vermillion, Ohio. He states that these plans have been under consideration for some time, but they reached the conclusion that now is the ideal time to proceed with any work which will increase the earning capacity or show a saving in operating expenses. Not only is the operating company reaping the advantages of a "buyer's market" but is also stimulating business in general, therefore, these plans call for completion not later than November 1, 1932.



View showing type of equipment used in the installation of the All-Relay switchboard at Vermillion.

The conversion of the Vermillion exchange to "All-Relay" automatic is the part of the Lorain Telephone Company's change problem. The Lorain exchanges general plan of solving the small ex- and the towns of Amherst and Birmingham are now operating on the automatic basis, with the toll traffic concentrated at Lorain.

The new switchboard for Vermillion is to be furnished by The North Electric Mfg. Company and will be wired for 300 subscribers' lines and will serve approximately 600 subscribers. This "All-Relay" automatic switchboard will be entirely free from moving parts, except relay armatures, and will be equipped with all the latest improvements for unattended exchanges, including automatic clearing of lines in trouble from the switchboard. Trunk lines will connect this exchange with the Strowger switchboard at Birmingham, which will permit subscribers in each exchange to dial into the other area without the assistance of an operator. Ten trunks will also connect the exchange with the toll board in Lorain.

Vermillion, Ohio is in the center of the Lake Erie's summer resort area and is also an important lake port. The Lorain Telephone Company is one of the outstanding companies in Ohio and serves approximately 11,000 subscribers in Lorain county just west of Cleveland. Mr. Hageman, secretary of the company, is also president of the Ohio Independent Telephone Association and one of the most prominent executives in the Independent industry.

BOWDLE ACCOUNTING SYSTEM MOVES TO CHICAGO

F. A. Bowdle, operator of the Bowdle Accounting System recently located in Wheaton, Illinois, removing from his former home in Cerro Gorda, Illinois.

Mr. Bowdle has opened offices at 185 North Wabash avenue, Chicago, where he will be better prepared to serve his patrons in future.

Pat: "Hullo, there! I want to know where I can get hold o' Mrs. Murphy."

Operator: "I don't know. She's awfully ticklish."

RADIOTELEPHONE BETWEEN VANCOUVER AND PRINCE RUPERT

Radiotelephone service in Canada between Vancouver and Prince Rupert was established January 15. A feature of the new connection is a 400-mile radio circuit between Prince Rupert and Campbell River and Vancouver Island. From the latter point connection is made with Victoria and Vancouver over the British Columbia Telephone company's long distance wires.

New radiotelephone sending and receiving apparatus has been installed at Prince Rupert by the Northwest Telephone company which is associated with the British Columbia Telephone company. The circuit route is 545 miles. The rugged British Columbia coast line has made it impossible to provide long distance telephone service for Prince Rupert by wire alone.

STROMBERG-CARLSON EQUIPS WAYNESBORO, PA.

(*Continued from page 33*)

An up-to-date supply room and warehouse is located in the rear of the telephone offices on the ground floor.

Installation of the new switchbroad and associated equipment was under the supervision of Mr. Twigg and Mr. Williams.

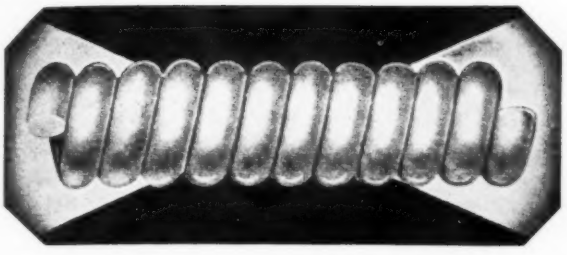
United Telephone employees who installed the new equipment are William Moore, J. E. Stahl, Lloyd Fetterolf, Robert Yottey, Gordon Snyder, Claude Anthony, Joseph Ginter, Earl Haller, Edgar Thurston, Edward Sersch, M. A. Rhine and J. H. Federhoof. C. L. Nichols represented the Stromberg-Carlson Company during the installation.

TELEPHONE ACCOUNTING & DEPRECIATION

(*Continued from page 30*)

this as a basis, the telephone exchange owner or manager who calls on residents of the town in which the exchange is located, as well as the outlying farms, will find many willing subscribers who are eager to have a telephone installed if they are guaranteed satisfactory service. They know it is not economy to be without a telephone, and if good service is assured, they will have one, though it be necessary to practice economy elsewhere.

To the owners of exchanges: Do not close your eyes to conditions and items of expense, actual or contingent. Pay the actual expenses and prepare for the contingent, for they do come. Prepare a budget carefully and operate within it. An accounting system will make you; lack of one will break you!



Galvanized Telephone Wire and Steel Strand

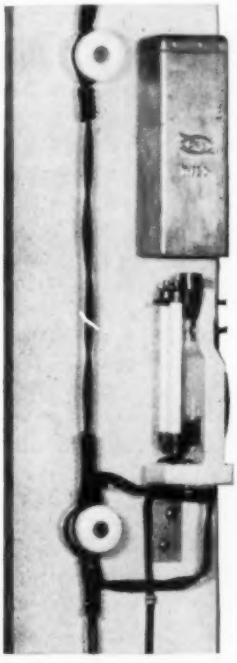
Crapo Galvanized Wire can be wrapped around its own diameter without injury to its pure zinc coating.... That is one of a number of reasons why **Crapo** Galvanized Telephone Wire and Strand can be depended upon to reduce maintenance cost.

Look for the **Crapo** Seal!

Indiana Steel & Wire Co.
Muncie, Indiana

Crapo
GALVANIZED PRODUCTS

COOK INDOOR OUTDOOR



STATION PROTECTOR

TYPE O-7

Mounted outdoors it keeps high potential out of subscriber's premises.

Adequate protection at low first cost and low maintenance cost.

Always accessible when mounted outdoors.

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COOK ELECTRIC COMPANY
2700 SOUTHPORT AVENUE CHICAGO, ILLINOIS

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Here **IS** *a buy*

$2 PER DAY

Buys a comfortable Room with bath at the

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on the East Side convenient to Grand Central Club facilities, with completely equipped Gymnasium

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Help your operators **cut toll losses**

In spite of the world-wide reputation of the Calculagraph, there is still an occasional telephone manager who appears not to appreciate in full the importance of this instrument as a safeguard against toll charge losses.

He is apt in all good conscience to place the blame on his toll-board operators—which is hardly fair, when the Calculagraph is so easily available. Operators with nothing but a time-of-day indicator and a pencil cannot be expected to provide 100% accuracy in their busy work. But you can demand 100% accuracy from the Calculagraph *at all times*—and get it!

With utmost precision, the Calculagraph mechanically computes and prints ELAPSED TIME. A pull of the handle clearly and indelibly stamps *on the toll ticket* the time of day of each call, also the actual ELAPSED TIME the circuit is in use, for any number of calls. No arithmetic by pencil—no diversion from other duties—no chance of error—the Calculagraph is easily and quickly operated while conversing with either the calling or answering party. The Calculagraph is now supplied in either the well-known spring-driven model or an electric-driven model operated by electric impulses from a master clock (24 or 48 volts), or by self-starting synchronous motor (60-cycle A. C.). Prices and detailed information on request.

THE CALCULAGRAPH COMPANY
50 Church St. Dept. 22 New York City

CALCULAGRAPH
THE ELAPSED TIME RECORDER

With Manufacturers and Jobbers

GOVERNMENT PURCHASES "ALL-RELAY" FOR FEDERAL PENITENTIARIES

The need for adequate and ultra-reliable telephone service in Federal Penitentiaries has been acknowledged by the Federal Government in contracting for two 200 line "All-Relay" systems for the existing Federal penitentiary in Leavenworth, Kansas and for the penitentiary now in course of construction at Lewisburg, Pa.

The very special nature of telephone requirements in penitentiaries was made the subject of a careful study by the Bureau of Standards. The service must first of all be instantly available at all hours of the day or night, and not dependant upon the presence and ability of an operator. This resulted in a decision in favor of dial-automatic equipment. Next, as the nerve system of the institution and the means whereby important communications are transmitted or orders given in emergency, the telephone system must represent the ultimate that can be achieved in speed, in accuracy, in freedom from service interruptions, and in dependability. This resulted in a very careful consideration and investigation of available types of equipment, and the drafting, by the Bureau of Standards, of a set of equipment specifications in which particular emphasis was placed upon dependability as the governing requirement. "All-Relay" equipment and Rotary Line-Switch were alone judged competent to compete, the final decision to be made on low price.

To meet the requirements in number of telephones, each system is of a 200 line capacity, capable of expansion, and with provision for a number of auxiliary services. These services include a special Executive Right-of-Way, limited to certain high officials and affording them absolute priority of service and access at all times to any station on the system. A special conference feature is included to enable a specified number of officials to participate in a general conference without absenting themselves from their respective posts of duty. In order to keep in touch with all watchmen, to receive their reports and register the watchman's whereabouts in the event of an emergency, a Watchman Reporting system is furnished with automatic registration, at a central point, of the calling station. Finally, all telephones are available for use in giving a fire alarm in which case also the location of the calling telephone is automatically recorded at a central point. All these features are furnished within the telephone system, and over the same network of wires, thus effecting considerable economies in cost of equipment and wiring.

In the writing of specifications and requests for bids, not only has particular attention been given to the type of equipment considered capable of conforming to the rigid requirements of dependability, but due regard has also been given to the type and quantity of equipment maintenance required, together with its cost over a period of years. The equipment manufacturers submitting bids were therefore required to furnish also a bid for maintaining the entire telephone system in satisfactory working condition for a period of five years.

In advertising for bids on a complete contract for the manufacture, installation, wiring and maintenance of these equipments, the Government specified the basis on which awards would be made; namely that, after complying with all the requirements of the specifications, the bidder naming the lowest figure for all equipments, wiring and labor of installation together with the aggregate cost of maintenance over the five year period, would be awarded the contract.

The North Electric Mfg. company was the successful bidder for both penitentiaries, being low in price, and meeting with its "All-Relay" equipment, all the rigid requirements of dependability and freedom from interruptions of service, together with minimum maintenance requirements and cost.

With the option of subletting the wiring contract, and yet being required to assume complete responsibility for the system as a whole, The North Company awarded the wiring subcontract to the Gustav Hirsch Organization of Columbus, Ohio.

NITROGEN GAS AND SPECIAL EQUIPMENT FOR LOWERING CABLE MAINTENANCE

The continuous growth of the telephone and telegraph industry increasing the use of lead covered cables throughout the country, has created a demand for new methods for maintaining cables to avoid interruptions in service.

One of the latest, and most economical methods to be developed is gas pressure for testing and locating breaks in the lead sheaths—which, if not located and repaired, causes considerable trouble with loss of service proving very costly. Nitrogen gas, which for cable work should always be oil pumped, is being used for testing and maintenance of cables under gas pressure. Nitrogen is an inert, odorless, colorless and harmless gas, and due to its absorption power is used for the elimination of moisture. In making cable tests nitrogen gas is injected into the cables through a valve similar to an automobile tire valve.

The Indiana Oxygen Company, manufacturers of compressed gases including oil pumped nitrogen, have developed and patented a line of special valves, plugs and tools for maintenance and testing of cables under gas pressure. A special tool is used for drilling the hole in the cable to receive the valve, —this tool being so constructed as to prevent any damage to the wires inside or the insulation. Then the valve is attached to the cable and the gas entered through the valve. This new type valve has three separate gas-tight seals, which insures against the loss of pressure in the cables. The third seal is formed by a brass cap fitting over the entire valve, which makes it waterproof as well as gas-tight.

The special plugs are so constructed that they can be soldered in place under pressure immediately—forming a gas-tight seal, which is a vast improvement over the old type plugs used heretofore.

A 32-page descriptive catalog—giving detailed information on nitrogen gas, its use for cable work, and complete description of the valve, plugs and tools, may be obtained free upon request from the Indiana Oxygen Company, Nitrogen Division, 437 South Delaware Street, Indianapolis, Indiana.

A NEW WEATHERPROOF LOUDRINGING EXTENSION BELL

The new 65 type Kellogg Loudringing Extension Bell, designed and manufactured by the Kellogg Switchboard and Supply Company of Chicago, is one of the latest developments in the telephone field and the finest unit of its kind. Sturdily constructed of selected materials by expert workmen, it will give many years of reliable service with little or no maintenance. Yet the price is very reasonable.

The Kellogg Extension Bell is especially designed to meet every telephone service requirement for indoor or outdoor use, on either common battery or

magneto lines. Completely weatherproof, it operates perfectly under any climatic condition. The Kellogg Loudringing Extension Bell is dependable and efficient, and is guaranteed to give satisfactory service.

It is unusually well adapted for taxi stands, coal yards, lumber yards, police and fire alarms, railroad yards and railroad shops, power houses, oil fields, mines, quarries, ice plants, greenhouses,

New Loudringing Extension Bell, placed on the market by the Kellogg Switchboard & Supply Co.

boiler rooms, docks, contractors' shacks, construction camps . . . in fact, everywhere that loudringing weatherproof extension equipment is required.

Only two connections are necessary to install the bell. It is wired directly to the desk set box or line so that any signal coming over the telephone line immediately operates the bell. The 6-inch steel gongs are scientifically designed to produce a loud clear ring. They have a durable weatherproof finish and are of eccentric design for easy adjustment.

The weatherproof housing consists of a heavy cast iron base with removable cast iron cover, held in place by two screws. It is finished with a durable coat of gray zinc paint. The bell can be mounted in a few minutes with three ordinary screws or bolts. Outside mounting holes eliminates the necessity of removing the cover when installing it. Overall dimensions, width 13 inches; height 12½ inches; depth 4½ inches; net weight 13½ pounds. For further information and technical details regarding the Weatherproof Extension Bell write Kellogg Switchboard and Supply Company, Chicago, Illinois.

"ALL-RELAY" FOR NEW YORK HOSPITAL

A magnificant hospital which, when completed and equipped, will cost in the neighborhood of $5,000,000, is being erected by the city of New York as an addition to the existing Bellevue Hospital. The new unit will occupy a complete city block and, when completed, will be the largest institution in the country devoted to the study and cure of psychopathic cases. It will also boast of the most modern equipment for the furtherance of psychopathic research.

The new hospital is being erected on the city block adjoining the Bellevue Hospital with which it is designed to function as a single unit. A complete underground system of tunnels is provided to carry the traffic between the old and new units, and everything is being done to facilitate the correlation of activities.

Telephone facilities in such an institution are of paramount importance. The old Bellevue unit has for these many years owned and operated a P. A. X. of some 300 lines capacity, independent of the public system, and used exclusively for interdepartmental service. Benefiting by the experience gained in the operation of this system and realizing the merits of a dual system of telephones, steps were taken to provide new and up-to-date facilities in the new unit and to connect these in such an manner with the old unit as to provide complete intercommunicating services.

It is logical to suppose that the new unit would be equipped with the same kind and type of automatic telephone equipment as the old unit. However, in order to ensure greater dependability of service together with a very much reduced maintenance cost, and to maintain the high standards of modernity set for this clinic, a contract was placed for telephone equipment constituting the latest completed, tried and proven development in the automatic art.

A 200 line "All-Relay" dial-automatic switchboard was purchased for the new unit, with complete two-way trunking facilities with the Bellevue unit. The choice of this equipment was made under conditions which illustrate the difficulties with which architects and engineers have to cope on a project of this importance and magnitude. With the obvious implication of adverse criticism of their good judgment, they were showered with representations adverse to "All-Relay" equipment and designed to influence their judgment against its use. As to whether "All-Relay" equipment would fail to conform to the high standards set for the clinic, whether it would fail to give good service, whether it would cost more to maintain and, finally, whether it would operate in conjunction with the older equipment in the old unit, be it said that it was simply necessary for the architects and engineers to ascertain the underlying facts by investigation of "All-Relay" service at other points, by comparison of its cost of maintenance, and by reference to such installations as the Duke University where a 300 line "All-Relay" system trunks directly into the automatic system of the City of Durham, for them to remain satisfied with their choice of it for the new hospital.

The telephone instruments in the new unit will be mainly of Stromberg-Carlson manufacture equipped with North Company's dials, which will thus be called into operation on both the "All-Relay" equipment in the new hospital and the P. A. X. equipment in the old.

A NEW TELESCOPING POLE DERRICK

Another new development adds to the flexibility and efficiency of the Highway Model "HC" Earth Boring Machine—a power operated telescoping derrick that sets short poles or works under low leads at a minimum height of 16 ft. or raises, by motor power, to any height up to 22 ft. above the ground for handling long poles.

This new type derrick is built into the boring unit as an integral part. It consists of two sections of special alloy seamless heat-treated steel tubing, the upper one of which telescopes into the lower under the control of the motor. The power is taken thru the boring head and applied to the upper section through a worm and rack arrangement. Control is by means of a lever mounted on the lower tube support within convenient reach of the operator.

When at minimum height the boring machine leveling device permits the derrick to rest horizontally on the truck platform out of the way for traveling or storing. When the truck is backed into working position, a slight movement of the power leveling control brings the derrick into vertical position in a few seconds time. Another movement of the derrick control lever raises the derrick to the required height in another few seconds time.

The usual difficulty of working under low heads is reduced to a minimum. The labor, loss of time and hazard of assembling and disassembling the old type of pole derrick by hand is entirely eliminated.

ROWLAND NOW WITH KEARNEY

Grattan W. Rowland, formerly connected with the Tennessee Electric Power Company at Chattanooga as Assistant Electrical Superintendent, is now connected with the James R. Kearney Corporation in its southeastern territory.

Mr. Rowland's past association with the problems of the industry will make him well suited for his new position.

THE TECHNICAL CLEARING HOUSE

(*Continued from page 26*)

under paved streets and intersections?

A.—The method most generally employed is to dig a trench about 8 to 10 feet in length at one side of the pavement and at a depth at which it is desired to pass under the pavement. A one to three inch iron conduit is then pushed under the pavement using either a heavy R. R. type jack, or a regular pipe pushing jack. A trench should also be dug on the side opposite from which the pipe is being pushed. Pipe can be pushed quite readily in most soils except coarse sand or gravel. After the conduit is in place the cable can be pulled out along the trench and at the point where it crosses under the street it can be fed through the conduit and pulled on out to its full length in the usual manner. Care must be taken to avoid injury to the sheath at both ends of the conduit during the pulling in process. This can best be accomplished by using a shield made of leather which is fitted into the ends of the conduit. Figure 3 illustrates the method recommended.

ONE ANTENNA ACCOMMODATES 3,000 RECEIVING RADIOS

(*Continued from page 13*)

tuned, push-pull type. This amplifier has a sufficient gain and power capacity to supply 750 radio sets and the system can utilize four such amplifiers, bringing the total sets to 3,000.

Each stage of the amplifier is equipped with an adjustable degenerative circuit for suppressing second order modulation. This circuit prevents the production of "phantom stations" in the amplifier. All vacuum tubes used in these amplifiers are the indirectly-heated cathode type. This prevents the production of power hum usually experienced with filament type vacuum tubes heated directly by alternating current. The amplifier is self-contained with complete power supply. It operates on 50 or 60 cycle alternating current at 103 to 127 volts.

Ten lines issue from each amplifier, each line capable of operating 75 radio sets. The line from the amplifier to the furthest receiving set may be 750 feet long. Thus even in large buildings the entire amplifying equipment may be centralized at one point, such as the basement. The only apparatus needed at the point where each radio set plugs in is a small unit having an attenuator which prevents the sets from re-acting back onto the line.

KELLOGG BOARD IN SERVICE FOR 31 YEARS

Not long ago, Mr. O. B. Bourne, Kellogg representative at Kansas City, Missouri, received a Kellogg magneto switchboard that had recently been removed from an active exchange because larger switchboard capacity was required.

The plate on the board bore the number 85. Upon checking back, records show that this 150 line Kellogg Express type magneto switchboard had been originally sold to the Sparta telephone Company of Sparta, Illinois, on April 3rd, 1901—just thirty-one years ago.

This switchboard was still in working condition when taken out—a real record of service. "That's putting real quality into central office equipment."

The Bell Telephone Company of Sherwood, N. D., has strung up new long distance wire connections between its line at Great Northern depot and Central West Public Service company.

We will sell your
Telephone Directory ADVERTISING
or will publish your directory complete
L. M. BERRY & CO. DAYTON, OHIO

RECONSTRUCTED EQUIPMENT

Western Elec. No. 25A or No. 76 repeating coils—2 coils mounted on one mounting block, per pair @	$ 5.25
Kellogg No. 101E 500 ohm combine line drops and jacks, 10 per strip @	11.50
Stromberg No. 11 combine line drops and jacks, per strip of 5 @	7.00
Holtzer-Cabot 110-volt A. C. Motor H. P. ⅛ Speed 1150 R. P. M. @	10.00
Kellogg No. 2812 Latest type 5-bar 1600 ohm Bdg. compacts @	10.50
Kellogg No. 84 desk set with No. 2361 5-bar 1600 ohm inside connection signal set @	11.75
Kellogg No. 301 Combine line drops and jacks, per strip of 5 @	7.50
Kellogg No. 97 C. B. desk set with Straight line No. 75 Steel bell box @	7.00
Cook No. 10 Arresters, per bank of 20 lines with heat coils @	8.50
Chicago Tel. Supply Co. 4-bar 1600 ohm Bdg. compacts @	6.25
Western Elec. No. 22 3-bar Generators with Crank & Screws @	1.50
Stromberg No. 104 type 4-bar 1600 ohm Bdg. compacts @	6.90
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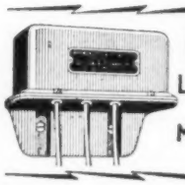
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